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Note.—As far as possible, the country of origin quoted in the items refers to the original source.

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The Career of the Engineer Officer in the Luftwaffe. (Flugsport, Vol. 32, No. 13, 19/6/40, pp. 191-192.) (100/1 Germany.)

No fresh entries for the existing engineer corps of the Luftwaffe will be accepted and the corps will be disbanded in due course. In its place the grade of engineer officer has been created, which carries the same rank as the active officer with the addition of the letters (Ing) and is subject to the same laws and regulations. The new corps will be partly recruited from pupils who hold the leaving certificates of higher schools and who enter the air force as ensigns (Ing). Till they obtain promotion as lieutenant (Ing), their training will be the same as that of ensigns for the active flying grades. Their preliminary and principal technical training will follow on this first promotion and will be in the form of specialised courses. Engineer officers of exceptional ability will obtain the chances of further specialised technical training.

Engineer officers will wear the standard Luftwaffe uniform, with a pink " arms " badge. Present members of the engineering corps can become engineering officers under certain conditions.

Examination of Firing Errors in the Case of Small Calibre Anti-Aircraft Guns. (H. Donatsch, Flugwehr and Technik, Vol. 3, No. 9, September, 1941, pp. 208-212.) (100/2 Switzerland.)

Small calibre guns use contact fuse ammunition and the firing error is thus determined by the distance between target and shell when the latter passes through the target plane (containing flight path of target and perpendicular to shortest distance from gun).

The problem is therefore to determine the instant the tracer ammunition passes through this plane and for this purpose the author suggests observation of the trail at a definite time interval after firing the gun. This interval corresponds to the time of flight of the shell for the target distance as measured by the range finder. It is stated that the method is much simpler and more accurate than the usual procedure of estimating passage of trail through target planes by purely stereoscopic means.

The Verograph—a New Training Device for A.A. Fire Control. (Flugwehr and Technik, Vol. 3, No. 9, September, 1941, pp. 212-215.) (100/3 Switzerland.)

The accuracy of A.A. fire depends primarily on the correct estimation of the distance of the target. For this purpose, stereoscopic range finders are usually employed, which unfortunately depend chiefly on the keenness of stereoscopic vision of the observer. In order to weed out unsuitable personnel at the earliest possible stage of training, the author describes an automatic device (the verograph) operating on the theodolite principle, which records the true distance of a moving target, provided the latter is kept in the field of view of the telescopes.

The distances estimated with the steroscopic range finder are transmitted to the verograph and the pupil will thus see a graphical record of his errors at various distances.

Aircraft Armour and Development Trends in Aircraft Construction. (C. Rougeron, Inter. Avia., No. 802, 10/2/42, pp. 1-5.) (100/4 France.)

It is strange that whilst the need for armour protection is recognised both on sea and land, the air force of all countries had no armour until the Germans introduced it in 1940. Its advantages were so obvious that it has now become standard on all fighters and bombers. The fighter requires both front and rear protection. For the former, the engine plus a bullet proof windscreen is generally considered sufficient, armour plate being restricted to the pilot's back and seat (rear protection).

In the case of the bomber, the armour plating is also disposed to give protection of the rear, the separate gun installations requiring separate protection.

It is now generally recognised that the aircraft structure has little to fear from either solid or explosive ammunition of a calibre likely to be used in air fighting for some time to come. Armour plating can thus be restricted to the crew and engine, since self-sealing tanks offer adequate protection. From the point of view of weight to be carried, it is obvious that the same plating should protect more than one vital point and the development towards smaller crews concentrated in one locality is indicated, even if this entails remote control for the guns. At the same time single power plants of large output offer distinct advantages. The present day " Flying Fortresses " are a misnomer.

Aircraft Machine Gun and Aircraft Cannon. (C. Rougeron, Inter. Avia., No. 800, 22/1/42, pp. 1-5.) (100/5 France.)

The fire power of the 1939 fighters armed with machine guns was incomparably greater than that of their predecessors in 1918: Double the rate of fire (1200 against 600 rounds per minute) and 6 to 8 guns against the two originally carried. Moreover most of the guns are now installed outside the airscrew arc, since modern wing structures are strong enough for this purpose. This enables the highest rate of fire to be utilised and moreover removes a possible source of breakdown.

At the outbreak of the present war, the British relied entirely on a large number of machine guns of about .3 in. calibre. Most of the French and German aircraft had a smaller number of guns, but included at least one cannon (20 mm.) in their armament. It was evidently felt at the time that one of the heavier weapons was the equivalent of several machine guns. This conclusion (probably influenced by exaggerated claims made for explosive ammunition based on tests carried out with absolete types of aircraft structure) was shown to be erroneous. The machine with the greater rate of fire proved to be superior in aerial combat and plans were made to increase the number of machine guns still further when the adoption of armour plating by the Germans (Autumn 1940) showed that the machine gun bullet of .3 in. calibre was no longer sufficient to produce decisive results.

At the moment we see a race between calibre and strength of armour. Whilst protection against the .3 machine gun is relatively simple, armour capable of withstanding 37 mm. explosive shells presents difficulties. On the other hand such heavy guns have a low rate of fire and can only carry a limited amount of ammunition.

On account of the difficulty of aim in high speed combat, the importance of being able to sustain the attack and not run out of ammunition is obvious. As a result, a compromise has been adopted by the various airforces. The Spitfire Mark III of the R.A.F. is stated to have three 20 mm. cannons and four 7 mm. machine guns, the Italians use 13 mm. machine guns, whilst the Germans (Me 109 F) have two 13 mm. machine guns (synchronised) and a 15 mm. cannon of a very high rate of fire. The armament of American Aircraft appears to be still in a state of flux and all sorts of combinations of calibre appear to be under investigation.

Official Statistics on Fires Due to Enemy Action in Italy during 1940. (P.Z. Korrespondenz (A.R.P. News), Vol. 6, No. 251, 22/10/41, p. 8.) (100/6 Italy.)

This article is a German abstract of a report issued by the Italian Ministry of the Interior covering fires which have occurred throughout Italy during 1940. It appears that over the latter half of that year, 444 fires were due to enemy action (incendiary bombs). Of this total, 192 occurred in Mailand, 50 in Turin and 30 in Naples. The Italian official report emphasised that the damage due to fire greatly exceeded that due to explosive bombs and the best method of reducing danger due to incendiaries is to attack the fire as soon as possible, besides ensuring that the storing of inflammable material is under strict control.

The total number of fires from all causes is given as 6,000, involving a loss of 180 million lire. The loss due to incendiaries (444 fires) is given as 15 million lire.

The original report also contain statistics of other bomb damage and it is stated that the losses incurred are on a moderate scale.

Aircraft and Torpedo (with a List of Representative Types). (Inter. Avia., No. 796-797, 20/12/41, pp. 1-4.) (100/7 Switzerland.)

It may be assumed that engineers and armament specialists will devote all their energy and all available means to the development of this promising branch of naval aviation. For, if it is possible to employ obsolescent aeroplanes capable of a maximum speed of hardly 150 m.p.h. as successful carriers of slow, heavy and delicate torpedoes, what are the possibilities that are opened up by the development of such an arm!

The necessity for a greater range of the torpedo-bomber aeroplane is indicated first of all by the great vulnerability of the aircraft carrier, as has amply been proved by the experiences made so far in this war. The air speed of the torpedo-bomber, on the other hand, determines not only the initial speed of the aircraft torpedo, but it is also the only means at the disposal of the attacking aeroplane to escape, at least in a certain degree, the defensive fire of the warship. As long as the torpedo is unreleased, the defensive batteries form the main defenses of the ship; the future will teach if the slow-flying aeroplane which, due to its manœuvrability, can bank away immediately after releasing its torpedo, is actually superior to the high-speed aeroplane in this respect. Once the torpedo is properly aimed and released, the ship can escape being hit only by an immediate change of course or speed. As long as the torpedo itself is not capable of speeds which will leave no time for such manœuvres, the ship still has—excepting in surprise attacks—the possibility of evasive action. It seems to be of paramount importance, therefore, to increase the average speed of the torpedo.

The greatest attention in the future development of aeroplane-torpedo combinations must therefore no doubt be devoted to the creation of an efficient aircraft torpedo. It would seem to be doubtful that the torpedo weighing 1,500 lb. to 2,200 lb., which in its basic design has largely been taken over from the navy, will continue to form the equipment of modern torpedo bombers. It does not seem to be clear if the control mechanisms of the naval torpedo (the risk of which is great on impact with the water), are absolutely indispensable in the aircraft torpedo. The method of propulsion and the weight, too, seem to be determined rather by tradition than by their efficiency; in order to augment the speed of the torpedo, a drive by jet reaction would seem to be preferable to the propeller drive, at any rate for short distances. Furthermore, the height and angle of release will play a decisive role at a given distance of attack in the calculation of the greatest possible reduction of that portion of the aircraft torpedo's trajectory that must be covered in the water.

Types in use at present:—

U.S.A.—*Douglas TBD*-1 with semi-retractable landing gear and TBD-2 with fully retractable landing gear (P. and W. "Twin Wasp," 14-cylinder radial engine of 850 h.p.). Span, 50 ft.; length, 35 ft. One torpedo.

Northrop BT-1, a development of the Northrop A-17 two-seater ground attack aeroplane (P. and W. "Twin Wasp," 14-cylinder radial of 850 h.p.). Span, 41 ft. 6 in.; length, 31 ft. 10 in. One torpedo.

The British Fleet Air Arm exclusively employs the braced biplane with fixed landing gear on its aircraft carriers.

Vickers "Wildebeest" (Bristol "Perseus" air-cooled sleeve-valve engine of 835 h.p.). Span, 49 ft.; length, 38.4 ft.; gross weight, 8,160 lb.; maximum speed, 136 m.p.h.; range, 530 miles. One torpedo.

Blackburn "Shark" (Armstrong-Siddeley or Bristol radial engine of 700 h.p.). Span, 46 ft.; length, 35.2 ft.; gross weight, 8,050 lb.; maximum speed, 150 m.p.h.; range, 620 miles. One torpedo.

Fairey "Swordfish" (Bristol "Pegasus" air-cooled radial of 690 h.p.). Span, 45.6 ft.; length, 36.8 ft.; gross weight, 7,730 lb.; maximum speed, 152 m.p.h.; range, 750 miles. One torpedo. (Photo.)

Fairey "Albacore" (Bristol "Taurus" 14-cylinder twin-row radial of 900 h.p.). Span, 50.0 ft.; length, 39.8 ft. One torpedo. Other details of this type which in design greatly resembles the Fieseler Fi. 167 general purpose biplane of the German Luftwaffe, are not available at present.

Besides these torpedo-bomber biplanes especially designed for operations from the aircraft carriers of the Royal Navy, the Royal Air Force has a modern twin-engined torpedo-bomber designed for shore-based operations, the Bristol "*Beaufort*" (two Bristol "Taurus" engines of 1,065 h.p. each). Span, 58 ft.; length, 44 ft. 2 in.; maximum speed, 295 m.p.h. One torpedo.

The *German Luftwaffe* possesses the *Fieseler Fi.* 167 torpedo-bomber alluded to above, an aeroplane deeigned especially for use from aircraft carriers (Daimler-Benz D.B. 601 liquid-cooled 12-cylinder in-line engine). Span, 44.3 ft. (13.5 m.); length, 37.4 ft. (11.4 m.); gross weight, 9,930 lb. (4,500 kg.); maximum speed, 202 m.p.h. (325 km./h.); range, 930 miles (1,500 km./h.). One torpedo.

The landplane version of the *Arado Ar.* 95 two-seater general purpose aircraft can also be used for operations from aircraft carriers; in addition the seaplane version of the same type is being used as a catapultable torpedo-bomber type. *Arado Ar.* 95-*Sea seaplane* (B.M.W. 132 Dc. nine-cylinder air-cooled radial of 880 h.p.). Span, 41 ft. (12.5 m.); length, 36.4 ft. (11.1 m.); gross weight, 8,100 lb. (3,670 kg.); maximum speed, 165 m.p.h. (265 km./h.) (Photo.) *Arado Ar.* 95-*Land landplane*: Gross weight 7,300 lb.; maximum speed, 191 m.p.h. One torpedo.

Among long-range seaplanes the following two types should be mentioned:—

Hamburg Ha. 140 (two B.M.W. 132 Dc. air-cooled nine-cylinder radials of 880 h.p. each). Span, 69 ft. (21.0 m.); length, 57.7 ft. (17.6 m.); gross weight, 18,750 lb. (8,500 kg.); maximum speed, 198 m.p.h. (320 km./h.); normal range, 715 miles (1,150 km./h.); maximum range, 1,550 miles (2,500 km.). One torpedo.

Heinkel He. 115 (two B.M.W. 132 Dc. air-cooled nine-cylinder radials of 880 h.p. each). Span, 72.8 ft. (22.2 m.); length, 56.7 ft. (17.3); gross weight, 20,000 lb. (9,100 kg.); maximum speed, 220 m.p.h. (355 km./h.); range, 1,300-1,860 miles (2,100-3,000 km./h.). One torpedo.

The well-known *Heinkel He.* 111*K* twin-engined bomber landplane has been fitted for torpedo-bombing duties by the addition of racks for the suspension of two torpedos.

Among *Italian torpedo-bombers* the following types may be mentioned:—

*Cant Z.*506*B* seaplane (three Alfa Romeo 126 RC. 34 nine-cylinder radials of 770 h.p. each). Span, 87 ft. (26.5 m.); length, 62 ft. (18.9 m.); gross weight, 26,900 lb. (12,210 kg.); maximum speed, 227 m.p.h. (366 km./h.); range, 1,240 miles (2,000 km.). One torpedo.

Among torpedo-bomber landplanes there should be mentioned the *Savoia-Marchetti SM.* 84 three-engined bomber (Piaggio P.XI air-cooled 14-cylinder twin-row radials of 1,000 h.p. each); like the He. 111K this type is fitted with two torpedo racks beneath the fuselage. Gross weight, 27,800 lb. (12,600 kg.); maximum speed, 295 m.p.h. (475 km./h.); range, 4,960 miles (8,000 km.).

Caproni Ca. 313 (two Isotta-Fraschini RC. 35 air-cooled in-line engines of 850 h.p. each). Span, 53.2 ft. (16.2 m.); length, 38.4 ft. (11.7 m.); gross weight, 12,450 lb. (5,650 kg.); maximum speed, 285 m.p.h. (460 km./h.); range, 620 miles (1,000 km.). One torpedo.

Comparison of British and German Fighter Armament. (Inter. Avia., No. 794-795, 13/12/41, pp. 19-22.) (100/8 Switzerland.)

The British Hurricane and Spitfire fighters are equipped with 4 to 12 machine guns (.303 Browning, firing rate 1,100 rds./min.) and 2 to 4 cannons (20 mm. Hispano-Oerlikon 600 rds./min.).

The German Messerschmitt is provided with 2 machine guns (Rheinmetall-Borsig, .311 cal., 700 rds./min.) and 1 to 2 cannons (either 20 mm. R. Borsig, 500 rds./min., 20 mm. Mauser, 800 rds./min., or 15 mm. Mauser 900 rds./min.

The weight of fire per minute is considerably superior for the British machines (viz. 600 lb./min. Hurricane IIc against 240 lb./min. for Me 109F2).

Similarly, superiority is shown if the comparison is restricted to weight of cannon fire only.

The author calls attention to the fact that this comparison leaves out of account possible differences in muzzle velocities of the German and British guns (this would affect accuracy of aim) as well as weight of ammunition supply and reliability of gun feed. As regards the latter, the advantages of a 15 mm. cannon are especially stressed.

Will Accessories Improve the Payload? (Autom. Ind., Vol. 86, No. 2, 15/1/42, pp. 34-35.) (100/9 U.S.A.)

An estimated 25.6 per cent. increase in equipment weight of a typical fighter aircraft, principally due to increased armament, is indicated over the past two years. An increase of over 48 per cent., in the same period, is indicated for commercial planes, due to demands for increased safety, comfort and convenience for the passengers.

Table I illustrates the military aspect, and Table II the commercial aspect of the problem.

TABLE I. FIGHTER AIRCRAFT.

Added Equipment.	lb.	Per cent. Increase.
Structural increase for pressurised cockpit (or cabin)	130	2.2
Cockpit (or cabin) pressurisation equipment	170	2.8
Armour plate protection for pilot	160	2.7
Armour plate protection for 20 mm. ammunition	30	0.5
Bullet proof glass for pilot's face	28	0.5
Leak retardent fuel cells at 1.2 lb./gal. ...	216	3.6
.50 Cal. ammunition increase from 200 to 500 rounds	360	6.0
Larger ammunition boxes for increased capacity	24	0.4
.20 mm. cannon ammunition increased from 60 to 150 rounds	55	0.9
Larger 20 mm. ammunition box for increased capacity	20	0.3
Automatic 20 mm. ammunition feed ...	20	0.3
Additional radio equipment	35	0.6
Miscellaneous	30	0.5
Sub-total all increases less structural for increased gross	1278	
20 per cent. allowance for design changes and structural reinforcement to take care of increased gross weight	255	4.3
Total increase	1533	25.6
Theoretical original gross weight of 2 years ago	6000	
Present theoretical gross weight	7533	

TABLE II. COMMERCIAL AEROPLANE.

	1939.	1941.
Nose Landing Gear		425 lb.
Pressurisation		460
Surface Controls	188 lb.	856
Electrical	248	971
Communication	300	587
Furnishings	1209	6119
Anti-icing	149	315
	2094 lbs.	9733 lbs.
	149 lb./passenger (14 pass.)	221 lb./passenger (44 pass.)

The demand for mass production has forced the aeroplane builder to purchase as much as possible from outside sources. Therefore the amount of sub-contract work and purchased equipment is increasing. As indicated by the accompanying chart, only 48 per cent. of the weight of the plane empty is credited to design and material; while 68 per cent. of the useful load is credited to fuel, oil and pilot. The result is that only 51 per cent. of the gross weight is within the control of the weight engineer.

It is suggested that in order to prevent further weight increases a programme of weight education be instigated by the equipment manufacturers who at present do not have such a programme. It is believed further that through (1) establishment of closer co-operation between aircraft manufacturers and vendors—by means of meetings and frequent conferences; (2) more accurate weight listings by vendors in sales literature and catalogues; (3) greater concentration on design of equipment in respect of weight; (4) cultivation on the part of vendors of weight consciousness; that improvements will result which will be beneficial to both vendor and vendee.

The Mathematics of Curves of Pursuit (Relative Motion of Fighter with respect to Attacked Bomber. (F. Gabriel, Luftwissen, Vol. 9, No. 1, Jan., 1942, pp. 21-24.) (100/10 Germany.)

The curve of pursuit examined by the author is the shortest path on which the fighter will get immediately behind the bomber and thus be able to use his fixed guns without correction of aim. Such a curve is characterised by the fact that the axis of the fighter is continually pointing at the bomber during the whole course of the approach. The author examines the path of the fighter relative to the bomber and obtains expressions for the bomber's sighting angle on the supposition of infinite projectile speed. This angle σ_v (measured from the longitudinal axis of the bomber) corresponds to direction of the relative motion of the fighter and will reach a certain maximum value, given by the expression

$$\tan(\sigma_v/2) = \surd\ \{(n-1)/(n+1)\}$$

where

$$n = \frac{\text{absolute speed of fighter}}{\text{absolute speed of bomber}}.$$

The rate of change of σ_v will be maximum if $\cos\sigma_v = n/2$. Accurate fire in all directions from the bomber turret requires very complicated sights. The author hopes that by concentrating on certain positions of the curve of approach, a considerable simplification in the turret sights can be effected. It is the object of the present article to stimulate research on these lines.

Observations of the Effect of Wing Appendages and Flaps on the Spread of Separation of Flow Over the Wing. (G. Hartwig, L.F.F., Vol. 18, Nos. 2-3, 29/3/41.) (R.T.P. Translation T.M. 988.) (100/11 Germany.)

The spread of the separation of flow on three tapered wings in symmetrical and unsymmetrical flow was observed with silk tufts. By equal thickness and chord distribution the wings manifested a different form of lifting line. One of the wings—with twist and dihedral—was, in addition, explored with fuselage, engine, nacelles, and flaps deflected. The principal result of the study was that the wings of themselves alone first disclosed complete breakdown of flow at the tips, even the one with twist, but that after adding fuselage and engine nacelles, the twisted wing broke down first completely in wing centre. The observed boundary layer motions transverse to the main flow direction were briefly explored as to their possible influence on the spread of the separation. On top of that certain disclosures were afforded in which the transverse motions observed in the boundary layer became perceptible even above the boundary layer.

While the relationship between breakdown of flow and contour and twist has been experimentally studied by various sources, there is little data on the breakdown of flow over the wing in the presence of appendages such as fuselage, engine nacelles, or deflected flaps within the practical range of spans. In the course of development of the Focke Wulf-FW 200 (Condor) wind tunnel tests were made on the break-down of flow on several wings of identical chord distribution but dissimilar course of the lifting line, and extended on one wing to the case of appended fuselage, engine nacelles and flaps deflected.

Contribution to the Aerodynamics of Rotating Wing Aircraft (Pt. II). (G. Sissingh, L.F.F., Vol. 17, No. 7, July 20th, 1940.) (R.T.P. Translation T.M. 990.) (100/12 Germany.)

The interrelations established in an earlier report on this subject (R.T.P. translation T.M. No. 921) are used to study the best assumptions for hovering and horizontal flight. The effect of the twisted and tapered blade on the rotor efficiency is analysed and the gliding coefficient at different stages (from autogiro to helicopter) of horizontal flight compared. To the extent that model or full-scale test data are available, they are included in the comparison.

The best static thrust coefficients are obtained by blade loadings of $k_{sa}/\sigma=0.2$, according to the study of the hovering state, and this figure can be raised by about 15 per cent. by using a tapered blade.

On passing from hovering to horizontal flight, the best blade loading for the explored coefficient of advance of 0.35 shifts to $k_{sa}/\sigma=0.16$ for the autogiro and to $k_{sa}/\sigma=0.14$ for the helicopter, hence the r.p.m. should be increased.

The absolute best t is to be expected at speeds below 300 kilometres per hour. It should amount to about 1 : 12 for the rotor without additional resistances when using a blade which is favourable for hovering also. A comparison of the different flight states gives for $\mu=0.35$ (in agreement with flight tests), a superiority of the helicopter which, though it may not be generalised, makes it likely that the helicopter, because of its superior take-off and landing characteristics, will be successful in the near future.

Since additional resistances are more detrimental to the gliding coefficient of the helicopter than that of the autogiro, the greatest value for the helicopter should be placed upon an aerodynamically favourable design of the whole aircraft.

The Oscillating Wing with Aerodynamically Balanced Elevator. (H. G. Kussner and I. Schwarz, L.F.F., Vol. 17, No. 11 and 12, 10/12/40.) (R.T.P. Translation T.M. 991.) (100/13 Germany.)

The two-dimensional problem of the oscillating wing with aerodynamically balanced elevator is treated in the manner that the wing is replaced by a plate with bends and stages and the airfoil section by a mean line consisting of one or more straights. The computed formulas and tables permit, on these premises, the prediction of the pressure distribution and of the aerodynamic reactions of oscillating elevators and tabs with any position of elevator hinge in respect to elevator leading edge.

A Simple Method of Applying the Compressibility Correction in the Determination of True Air Speed. (W. C. Scholfield, Inst. Aeron. Sciences, 10th Annual Meeting, January, 1942, pp. 1-19.) (100/15 U.S.A.)

By reviewing the complete impact pressure equation which describes the pressure exerted by an air stream upon coming to rest, it is shown that the approximating assumption which is involved in the customary method of determining the true air speed of an aeroplane at altitude is no longer satisfactory for high speed aeroplanes. The compressibility error which is a result of this assumption is isolated, and a method is described whereby the necessary correction may be applied by constructing additional altitude curves of indicated air speed ($V\sqrt{\sigma}$) on the conventional air speed indicator calibration chart. The true air speed at any altitude is then determined by the usual method, from the known value of indicated air speed and atmospheric pressure and temperature. The error that results if the compressibility correction is not applied is shown to be plus 11 m.p.h. for a 400 m.p.h. aeroplane at 25,000 feet altitude. The method here presented for applying the compressibility correction is less cumbersome than other suggested methods, and has the additional advantages of retaining the use of the customary air speed indicator calibration chart. Finally, the possible effect of compressibility on the position error of a pitot-static head installation is briefly analysed and discussed, and the difficulties encountered in determining true atmospheric pressure and temperature in high speed flight are mentioned.

Resonant Vibrations in Pipe Lines (E. Lettan, Z.V.D.I., Vol. 85, No. 2, 11/1/41, p. 52.) (100/16 Germany.)

Compression shock waves have received extensive study in connection with detonation and supersonic phenomena. Pressure waves with a steep front leading ultimately to discontinuities can also be obtained in pipe-lines provided the vibration amplitudes under resonance conditions are increased sufficiently (even if the forcing impulses are of the simple harmonic type). The author has carried out experiments using a pipe 12 m. long and 7 cm. internal diameter, one end of which was attached coaxially to the cylinder of a small cycle engine, motored independently at speeds up to 4,500 r.p.m. The pressure in the pipe line was recorded by means of a piezo electric indicator working in conjunction with a piston built flush into the well of the pipe, whilst the air speed was obtained from the dynamic pressure acting on a small elastically mounted vane situated inside the pipe. It was found that up to the fourth harmonic; the resonance frequencies of the closed pipe agreed with those determined by the theory of small disturbances and a constant velocity of propagation of 344 m./sec. Discontinuities in the pressure and velocity distribution amounted up to .15 atm. and 42 m./sec. respectively in the case of the third harmonic. Whilst a survey of the pipe showed well pronounced and stable velocity modes, the pressure nodes do not persist and the pressure impulses retain their full strength. The author concludes that compression shocks are not likely to be produced by resonance in open pipes.

On the Effect of Laminar and Turbulent Flow on the X-Ray Diffraction Diagrams of Water and Nitrobenzol. (W. R. Dubs, Z.V.D.I., Vol. 85, No. 2, 11/1/41, pp. 50-52.) (100/17 Switzerland.)

The author investigated the X-ray diffraction diagrams (Debye-Scherrer patterns) of jets of water and nitro benzol in free air. The jet was approximately .81 mm. diameter and its degree of stability (laminar or turbulent flow) was estimated from corresponding experiments with coloured filaments on a model of 11 times the scale. In this connection it is interesting to note that the laminar resistance law was still obeyed when the filaments showed appreciable departure from strictly laminar flow.

The diffraction diagrams did not show any effect which could be definitely attributed to the change over from laminar to turbulent flow. Such small effects in intensity distribution as were noted in the case of nitro benzol can be attributed to changes in temperature accompanying the alteration in the type of flow.

The author concludes that for the two liquids investigated there is no evidence of any change in the quesi crystalline structure with breakdown of laminar flow.

Similar experiments with other liquids are planned.

Flow of Incompressible Fluids Through Centrifugal Rotors. (E. Germaget, Z.V.D.I., Vol. 86, No. 7-8, 21/2/42, p. 108.) (Digest.) (100/18 Germany.)

According to the simple Eulerian (one dimensional theory), the blade passages of either turbine or compressor are always completely filled with fluid.

Visual experiments carried out by the author show that is very far from being the case, even if the operative conditions are those corresponding to maximum efficiency. The actual flow is generally very complicated, both vortices and lateral flows are formed and in addition separation may take place at the blades. Generally speaking, disturbances are more pronounced in the case of pumps than with turbines. This is to be expected from the characteristics of retarded and accelerated flow respectively. Backward curved blades were found to be beneficial, especially if the machine is operating with partial admission.

As is well known, theory indicates the possibility of pulsating flow through a centrifugal pump even in the presence of an ideal liquid. It is interesting to note that the author was able to obtain this operative condition in several cases.

The author utilised the experimental data to obtain mathematical expressions for the losses both of a full and part load.

The reviewer considers this work of great importance in clarifying frictional phenomena associated with the mixing of liquids moving with different speeds.

The Effect of Propeller Slipstream on Downwash. (A. V. Baranoff, L.F.F., Vol. 19, No. 1, 20/1/42, pp. 1-10.) (100/21 Germany.)

The investigations are confined to the effect of the slipstream on that part of the downwash produced by the change in the circulation distribution along the wing. The direct contribution of the slipstream to the downwash is not considered.

In the undisturbed state, *i.e.*, in the absence of the wing, the flow in the slipstream is parallel to that in the external region and both flows are uniform. This fundamental distribution is disturbed by the wing, which is assumed to intersect the slipstream symmetrically at right-angles to the flow. It appears that only two extreme cases of the problem are readily amenable to mathematical treatment, *i.e.*, the slipstream velocity differs either very little or very considerably from the external velocity. In either case the circulation distribution along the wing is obtained in trigonometrical form by a method similar to that of Lotz and from this the disturbance velocity at infinity (*i.e.*, approximately at the tail surfaces) is calculated. Some mean values of the downwash are calculated and compared with available experimental values. It appears that agreement is better if large differences in velocity between slipstream and outer region are assumed. Of interest is an investigation on the "rectifying" effect of the wing on the twist of the slipstream. It appears that about one-third of the twist is taken out.

Flutter of Shallow Chord Profiles. (A. Schallenkamp, L.F.F., Vol. 19, No. 1, 20/1/42, pp. 11-12.) (100/22 Germany.)

Quite frequently in flight, shallow chord profiles such as streamline wires, antenna masts and struts exhibit a kind of flutter which differs from wing or control surface flutter in the sense that the bending amplitudes are very large compared with the chord of the profile. Under these conditions, the vortices shed are no longer confined to the profile plane and the standard mathematical treatment for non-steady air forces cannot be applied. Making use of simplifying assumption regarding the air and friction forces, the author obtained a criterion as to whether or not freedom from flutter can be achieved by suitable mass coupling.

It appears that in the case of bending torsional vibration and sound flow (*i.e.*, no separation), flutter can be prevented by a displacement of the C.G. of the profile towards the front. If, however, the flow is accompanied by separation, a different kind of flutter with either one or two degrees of freedom may arise. In this case, provided the bending and torsional frequencies are nearly equal, flutter can be prevented by displacing the C.G. towards the rear.

Statistical Analysis of the Time and Fatigue Strength of Aircraft Wing Structures. (H. W. Kaul, Jahrbuch, 1938, der Deutschen L.F.F.) (R.T.P. Translation T.M. 992.) (100/23 Germany.)

The results from stress measurements in flight operation afford data for analysing the frequency of appearance of certain parts of the static breaking strength during a specified number of operating hours. Appropriate frequency evaluations furnish data for the prediction of the required strength under repeated stress in the wing structures of aircraft of the different stress categories for the specified number of operating hours demanded during the life of a component. The measures adopted obviously will depend on the magnitude and frequency of the loads during the life of the aircraft and will vary with the type of aircraft, purpose of use, and atmospheric conditions (gustiness).

The author has subjected to statistical analysis a large number of data covering the wing stressing of six different civil aircraft ranging in weight from 2,000 to 6,000 kilograms. At the same time the stress frequency of application curves for three acrobatic aircraft is investigated. Thus, it is possible to estimate the probable number of times loads of a given magnitude will be applied to the wing structure over flying time ranging from 2,000 to 6,000 hours (life of aircraft depending on class), and to adjust the ground tests accordingly.

Load Factors Obtained on Civil Aeroplanes in Acrobatic Manœuvres. (E. I. Ryder, Inst. Aeron. Sci., 10th Annual Meeting, Jan., 1942, pp. 1-7.) (100/28 U.S.A.)

Results of load factor measurements made by the Civil Aeronautics Administration on thirty-eight small civil aeroplanes and the results of tests made by the N.A.C.A. for the Civil Aeronautics Administration, on five small civil aeroplanes, are presented. The maximum load factors measured in various manœuvres are summarised. The tests made by the C.A.A. were for the purpose of determining the suitability of the aeroplanes involved for use in the acrobatic phases of the Civilian Pilot Training Programme.

One particular feature of the tests by the C.A.A. was that the various manœuvres were conducted by first using a smooth technique and then by using a rough technique to simulate the action of an inexperienced student pilot. Following an analysis of the records thus obtained, the optimum entering airspeeds for the manœuvres on each particular aeroplane were determined for the purpose of placarding.

The effects of various factors such as entry speed, technique, etc., on the developed load factors are discussed.

General Flight Analysis of the Helicopter. (M. Knight, Inst. Aeron. Sci., 10th Annual Meeting, Jan., 1942, pp. 1-21.) (100/29 U.S.A.)

The flight path equation is obtained for the helicopter with thrust produced by tilting the rotor forward, thus eliminating the conventional propeller. The flight path range from vertical ascent to the shallow power dive is covered.

The basic assumption of the analysis is that the circulation about the rotor blades is independent of both radius and velocity. Since this assumption represents an ideal condition, the results are somewhat optimistic. However, the effect of varying the more important helicopter parameters can be determined with satisfactory accuracy. The simplicity of the method makes these determinations easy and rapid.

Within the limits imposed by the assumptions adopted, the following conclusions may be drawn from this analysis:—

1. The approximate flight characteristics of a helicopter can be obtained easily and rapidly.
2. The effect of changing the power loading, solidity, blade profile drag and parasite drag can be determined with satisfactory accuracy.
3. Extreme variations in both solidity and blade profile drag result in speed variations of less than ten per cent.
4. Changes in power affect vertical climb velocity to a greater degree than climb velocity in inclined ascent.
5. Variations in parasite drag produce large changes in level flight speed but have a negligible effect on vertical ascent.
6. The power required for hovering flight is sufficient to produce appreciable rates of climb at moderate forward speeds.
7. Minimum power for sustentation occurs at moderate forward speeds.

Ground Vibration Tests. (C. D. Pengelley, Inst. Aeron. Sciences, 10th Annual Meeting, Jan., 1942, pp. 1-29.) (100/30 Germany.)

The dynamics of a rigid body having two degrees of freedom has been presented. The complete solutions for nodal points and coupled frequencies have been obtained. The general solution for the nodal positions has been presented in graphical form which provides not only a physical picture of any system, but also a rapid means of evaluating the position of the nodes. Charts have been prepared from which the uncoupled frequencies, as required in flutter analysis, may be rapidly evaluated from data observed during vibration tests. Neglect of this item may produce an error of 20 per cent. in the calculated flutter speed.

A theoretical analysis has been made of the factors affecting the power and unbalance required to conduct vibration tests. It has been shown that, for a given amplitude the power absorbed by a wing is roughly independent of aeroplane size; however, for any given aeroplane it is from 2 to 16 times greater at torsional than bending resonance. At torsional resonance, with a tenth inch total motion of the trailing edge, a conventional wing absorbs 0.01134 h.p. Thus the theoretical power required is negligible, and the choice of a suitable motor depends upon the friction horse-power absorbed by the test equipment.

Numerical examples have been presented to illustrate the use of all principle equations and charts.

A discussion has been given on the new Curtiss-Wright Universal Vibrator, outlining its major points of interest.

A Kinetic Energy Correction to Predicted Rate of Climb. (F. C. Phillips, Inst. Aeron. Sci., 10th Annual Meeting, Jan., 1942, pp. 1-6.) (100/31 U.S.A.)

The assumption of zero acceleration along flight path, generally made in the interest of simplification in climb performance calculations, is pointed out, and the general performance equation re-stated for the case of finite acceleration. This assumption is shown to result in optimistic predicted rates of climb. The percentage error involved is analysed and shown to increase rapidly with aeroplane loading and with altitude, particularly in the stratosphere.

The war emergency is accelerating tremendously the trend toward higher operating altitudes and higher loadings for military aircraft. Increasing climb errors involved by these trends will shortly be of appreciable magnitude. The case of a high altitude bomber is given to illustrate this quantitatively. It is recommended that allowance be made in establishing climb performance guarantees and in correlating computed and flight rates of climb for the error incurred by assumption of zero acceleration along the flight path.

New Developments in Simplified Control. (R. H. Upson, Inst. Aeron. Sci., 10th Annual Meeting, Jan., 1942, pp. 1-12.) (100/32 U.S.A.)

Problems of control are presented from a standpoint of simple operation rather than mere mechanical simplicity. Of first importance is the elimination of inconsistent or abnormal behaviour, in which spinning is classed. The influence of wing and engine position is discussed, and several advantages of a car-type of wheel arrangement brought out.

A primary control, in which flaps are co-ordinated with elevator, and rudder with ailerons, is advocated. In a possible supplementary pedal control, ground brakes are co-ordinated with air drag obtained by opposite deflection of two rudder surfaces.

Special problems, considered from a standpoint of simplified control, include stability against overturning on the ground, inertia loads on the wing, spiral stability, and control requirements for following a compass course.

The ideal aeroplane for private flying is described as being outstanding in vision, incapable of spinning, comparable with a car in simplicity of control, yet with unquestioned superiority of cross-country performance.

The Design of Rotor Blades. (R. H. Prewitt, Inst. Aeron. Sci., 10th Annual Meeting, January, 1942, pp. 1-11.) (100/33 U.S.A.)

The factors which affect the design of flexibly mounted rotor blades, that is blades incorporating horizontal and vertical hinges, are practically the same for autorotating rotors and power driven rotors in so far as knowledge of power driven rotors has progressed to date. The major difference between an autorotating rotor and a power driven rotor so far as the design of blades is concerned, is that in the former type there is a small flow up through the rotor, and in the latter case there is a substantial downward flow through the rotor. Again, because of the relatively small flow up through the autorotating rotor, the blades may be built without twist and yet obtain optimum efficiency, while in the case of the power driven rotor, the blades will probably have a twist from root to tip similar to (but of less magnitude than) present engine propellers.

Still another difference lies in the fact that owing to the continual power input in the case of the power driven rotor, there are decided variations in the root structure. Nevertheless, this paper, though mainly directed to the autorotating blade, is largely applicable to the power driven rotor. It deals with the general aerodynamics and design of the blade, with the bending moments, with blade weight estimates, and with typical blade construction. The brief treatment will be of interest to designers and others working in the rotary aircraft field.

Tricycle Landing Gear Design. (E. S. Jenkins and A. F. Donovan, Inst. Aeron. Sci., 10th Annual Meeting, January, 1942, pp. 1-88.) (100/34 U.S.A.)

The problems of the tricycle landing gear are discussed in the light of available information with the object of providing criteria to assist the designer. The general geometric arrangement involving the determination of wheelbase, tread, and centre of gravity location is first considered. It is shown that the nose wheel should be located as far forward of the centre of gravity as possible, and the fore and aft location of the rear wheels is limited to a narrow range by conditions of balance and longitudinal stability. The relationship between tread, wheelbase, and the resistance to turning over is found and the effects of tread and fore and aft location of the rear wheels on the directional stability and ground manoeuvrability are discussed.

The problems related specifically to the design of the nose wheel are next examined. A basis for the selection of nose wheel and tyre size is given. The fundamental causes of shimmy are reviewed including the effects of trail, caster angle, wheel offset, tyre type, and moment of inertia of castering parts. Shimmy elimination is discussed with special reference to elimination by damping and including methods of calculating the amount of damping necessary to prevent shimmy. The construction of fluid dampers is described and their damping characteristics compared to the simpler mathematically defined types of damping. An empirical relationship between the volume of a vane type hydraulic damper necessary to prevent shimmy and the static nose wheel load is given.

Ground handling and manoeuvrability, construction and installation difficulties, castering locks and stops, and steering devices are briefly discussed. Conclusions as to the best arrangements must be based on the characteristics of the particular design. As a partial check on the validity of the criteria developed, the results of applying them to some successful tricycle gear aeroplanes are summarised.

Glider Development in the U.S.A. (Inter. Avia., No. 805, 27/2/42, p. 15.) (100/35 U.S.A.)

The following details have become available of a number of gliders and sailplanes ordered by the U.S. Army Air Forces and the Naval Air Service: *XTG-1 two-seater training sailplane*, built for the U.S. Army Air Forces by the *Frankfort Sailplane Co.*, of Joliet, Ill.; span 46 ft.. length 24 ft., gross weight 790 lb. *XTG-2 two-seater training sailplane*, built for the U.S. Army Air Forces by the *Schweitzer Aircraft Corp.*, of Elmira, N.Y.; span 52 ft., length 25 ft., gross weight 860 lb. *Troop transport glider*, built for the Naval Air Service by the *Allied Aviation Corp.*, of Baltimore, Md.; span 88 ft., capacity 12 men, gross weight 6,500 lb.; plywood construction. *Troop transport glider*, built for the Naval Air Service by *Snead and Co.*, of Orange, Va.; span 110 ft., capacity 24 men, gross weight 12,000 lb.; plywood construction. In this connection the American source mentions an unconfirmed report according to which the German Air Force has at its disposal gliders with a span of 140 ft. and carrying a far larger number of troops than the 15-man gliders previously employed, which are stated to have a span of 90 ft.

Flight Strips for Emergency Landing Grounds. (Inter. Avia., No. 805, 27/2/42, p. 21.) (100/36 U.S.A.)

The flight strips consist of portable metal " mats " with which the entire landing area is covered and which, without additional treatment of the ground covered, offer a bearing strength sufficient for normal bomber aeroplanes. These metal mats, so-called " Marston Strips " (named after the initial installation in North Carolina), consist of stamped steel panels measuring one-eighth inch in thickness, are provided with interlocking members along their sides and with two reinforcing longitudinal corrugations; in order to save weight, holes measuring 2¼ ins. in diameter are punched out. The individual strips are 10 ft. long and 16 in. wide, and are secured by spring clips against longitudinal movements after being laid down. The weight of each strip amounts to about 65 lb. The normal size of each landing ramp has been fixed at 150 ft. by 3,000 ft.; for such an area considerably more than 30,000 separate panels will therefore be needed, and the total weight of the entire ramp would exceed 1,100 short tons. The experiences so far made with this metal mat have shown a bearing strength corresponding to a concrete layer of about 4 in.; very satisfactory results are stated to have been obtained as regards grip and tyre wear. The steel ramp can easily be camouflaged by painting or by sowing grass, etc.

Modern Problems in Aircraft Construction. (G. Bock, Luftwissen, Vol. 9, No. 1, Jan., 1942, pp. 6-16.) (100/40 Germany.)

A digest of this paper appeared in Flugsport, Vol. 33, No. 26, and was abstracted in 98/6.

The following additional points are worth noting.

BOUNDARY LAYER DRAG.

The laminar profile drag coefficient of a wing is of the order .0007, whilst the fully turbulent layer has a drag coefficient of .0054. In practice the transition usually takes place near the point on the wing surface where the pressure begins to rise and the proportion of laminar flow can therefore be increased by adopting suitable wing shapes (maximum thickness displaced towards the rear).

Experiments for achieving this without disturbing C.P. displacement are being carried out.

COWLED RADIATOR DRAG.

Whilst the internal resistance of tunnel installations can be kept small, separation of the flow at the outer surface of the cowl may cause considerable drag. Suitable suction slots will prevent separation and improve the velocity distribution inside the cowl. According to model experiments on cowled wing radiators, the suction slot reduced the total drag from 9 per cent. to 2 per cent. of the engine power.

MECHANICAL AND EXHAUST DRIVEN SUPERCHARGERS.

In the mechanically driven supercharger the full exhaust energy is available for reaction propulsion, whilst the exhaust from the turbine contains less energy for this purpose. Since the effectiveness of jet propulsion increases rapidly with speed, the propulsive power characteristic of the mechanically supercharged power plant on a flight speed basis is very much steeper than that of the turbo supercharged plant. At 20,000 feet the two curves cross already at 400 km./h., *i.e.*, above this flying speed the mechanically supercharged plant has the greater propulsive power. At 40,000 feet, however, the mechanical supercharger only becomes advantageous at speeds above 1,000 km./h.

AIRCRAFT RESISTANCE AT HIGH FLYING SPEEDS.

Experiments in the supersonic wind tunnel on complete aircraft models (twin-engined) show a rapid increase in the resistance coefficeint between $M=0.7$ and $M=0.9$.

At the latter figure (corresponding to 1,000 km./h. at 6 km.) the drag coefficient increases to ten times its normal value (which is constant up to $M=0.6$).

CONTRA ROTATING PROPELLERS.

According to D.V.L. investigations, the efficiency of two four-bladed contra rotating airscrews at a flight speed of 1,000 km./h. will be about 10 per cent. greater than that of a single four-bladed screw (resultant tip speed = 320 m./sec. in each case).

Contra rotation produces a periodic variation in the aerodynamic force on the blade of the order of ± 10 per cent. of the mean force. This can easily be taken care of, provided resonance with blade frequency is avoided.

CONTROL FORCES AT HIGH FLYING SPEED.

The control forces increase rapidly with speed of flight and weight of machine. Thus to fly a horizontal curve of 1,000 m. radius with a given machine requires four times the stick force if the speed in the curve is increased from 500 to 900 km./h. Similar consideration applies to the pull out after a dive. If in the latter case the weight is doubled (surface loading and aerodynamic characteristics remaining unaltered) the elevator force required to pull out at the same radius and flight speed increases nearly four-fold. It is clear that heavy dive bombers will require carefully balanced elevators or better still servo control. During the pull out the wing structure is subjected to a considerable centrifugal load. Assuming a pull out radius of 500 m. from a 60° dive at 500 km./h., the acceleration during the pull out amounts to about 5 g. If the same manœuvre is carried out at 800 the acceleration is practically doubled.

Considerable care and ingenuity is required in the design of dive bombers in order to obtain structure capable of withstanding such loads with safety and yet sufficiently light.

A useful bibliography of 16 items (confined to German work) concludes the article.

On a Possible Connection between Tensile and Fatigue Limits. (A. C. Vivian, The Engineer, Vol. 172, No. 4,480, 21/11/41, p. 356.) (100/41 Great Britain.)

The author suggests that the following points of view deserve consideration and would welcome relevant discussion:—

(1) If any stress measurement can be used for estimating the fatigue limit, it must be the true tensile breaking stress.

(2) For ductile metals and perfect specimen the fatigue limit should be one-third of the tensile breaking stress. In the presence of imperfections, the ratio will be smaller than one-third. Higher value however will be obtained in the latter case if the stress range is gradually raised during the fatigue test.

(3) In the absence of ductility, no relationship between tensile strength and fatigue limits can be predicted.

New Magnesium Alloy. (Metal Industry, Vol. 60, No. 8, 20/2/42, p. 147.) (100/42 Great Britain.)

The addition of 6 per cent. silver to Dowmetal " X " (3 per cent. Al, 3 per cent. Zn, 0.2 per cent. Mn) produced the strongest magnesium alloy yet found. In extrusions it is heat treatable to a tensile strength of 55,000 lb./in.^{2}, a yield strength of 45,000 lb./in^2. and an elongation of 7 per cent., which approaches the properties of the commonly used 24S-T aluminium alloy extrusion (60,000, 44,000, 12 per cent. respectively) which, however, weighs 50 per cent. more.

This alloy is not yet adaptable to sheet. The best material so far produced which is workable is considerably weaker than Alclad 24S-T sheet, but the thicker sheet which will have to be used for aircraft skins would have the advantage of greater stiffness under compressive and shearloads. The 6 per cent. of silver in the alloy would about double the cost of magnesium alloy in ingot form. It would, however, provide an outlet for some of the 200 million ounces of silver produced yearly in the Americas, of which two-thirds has no use at present.

If a 6 per cent. silver alloy saves weight in aircraft, it will doubtless be worth the cost, as it has been calculated for civil aircraft on the basis of a five-year life and eight hours' daily flying that the income per lb. of dead load comes out to be about $35 per oz., so that weight saving is literally worth its weight in gold. This, also, incidentally points out the need for close tolerances on aircraft sheet.

Recommended Codes of Procedure for Fatigue Testing of Hot-Wound Helical Compression Springs (with Discussion). (C. T. Edgerton, Trans. A.S.M.E., Vol. 63, No. 6, Aug., 1941, pp. 553-560.) (100/43 U.S.A.)

This paper gives the recommended procedure for fatigue testing hot-wound helical compression springs in complete detail, so that any competent research technician, with only an elementary knowledge of spring theory, can successfully carry out a programme of fatigue tests on helical springs, with practically no other guidance than the instructions laid down in the code. This has been proved by actual trial.

The test procedure is planned to develop a complete S-N diagram for each group of variables, instead of merely an endurance limit (S = fibre stress, N = number of load cycles). In the actual plotting of the S-N diagrams, the Committee has developed a technique based on probability theory, which has been included in the code recommendations. The precision measurements and test methods prescribed in the code permit the computation of relative stresses in the test springs to a high order of accuracy.

It would seem reasonable to assume that there is a mathematical equation representing the S-N relation, the formulation of which awaits an exact determination of the statistical laws controlling the formation and propagation of fatigue cracks. The Committee feels that a studied guess at the correct form of equation is a constructive move. If results indicate that the guess is approximately correct, the use of such a formula has the important advantage that without it the research consists of a series of successive approximations to the correct value of the endurance limit, a quantity obviously immune to exact measurement. In testing helical springs, this procedure is very tedious and expensive, on account of the slow speeds to which we are limited. On the other hand, if the test data are fitted to a probable S-N diagram, every observation makes a considerable contribution to the corrections of the graph, and only one or two of the runs need be prolonged beyond 1,000,000 cycles of stress.

The Effect of Temperature on the Strength of Plastics. Second Report. Impact Strength Under Bending. (R. Nitsche and E. Salewski, Kunstoffe, Vol. 31, No. 11, November, 1941, pp. 382-388.) (R.T.P. Translation, 1,421.) (100/44 Germany.)

In a previous report (Kunstoffe, Vol. 29 (1939), pp. 209/220), the authors report on the effect of temperature on the bending strength of 29 representative plastics over the range −70°C. to +200°C. (Abstract 100/45).

The results under impact load are now presented over the same temperature range. The specimens were of standard dimensions (10 × 15 × 120 mm.) and were kept in air at the requisite temperature for a period of two hours prior to the test. They were then transferred to the impact testing machine and sprayed with a liquid at the required temperature. This spray was interrupted immediately before release of the pendulum of the particular machine used, which was either of 40 cm. kg. or 150 cm. kg. rating.

From a review of the results it appears that the generally held notion of the impact strength of plastic increasing with temperature can only be substantiated in a few cases. Everything depends on the nature of the plastic and the filler. Generally speaking cellulose derivatives are most sensitive to temperature. Some pressed resins with asbestos filling are practically unaffected by temperature. Others with fabric fillers show a continuous rise up to 140°C. and even at 200°C. the impact strength is still above room temperature value. Compressed wood has practically constant impact strength over the ranges −30°C. to +140°C. (48 cm. kg./cm.^{3}), but at 200°C. there is a sharp drop to about $\frac{1}{4}$ of this value.

This material is also of interest as having at −70°C. the largest impact strength (60 cm. kg./cm.^{3}) of any of the materials tested.

(For the others, the impact strength at −70°C. range from 4—38 cm. kg./cm.^{3}).

The great temperature sensitivity of plastics as regards impact strength necessitates specifying test temperatures to very close limits so as to ensure consistent results being obtained by different laboratories.

The Influence of Temperature on the Strength of Plastics—Strength Under Bending. (R. Nitsche and E. Salewski, Kunstoffe, Vol. 29, No. 8, August, 1939, pp. 209-220.) (100/45 Germany.)

Experiments were carried out on the effect of temperature ranging from −70°C. to 200°C. on the mechanical strength of 26 representative plastics. The tests covered bending, compression, tensile and hardness, but the present report only deals with variation in bending strength. Impact strength will be dealt with in a subsequent report (see Abstract 100/44).

The test samples were of standard dimensions 10 x 15 x 120 mm. and immersed in a bath kept at the requisite temperature. The rate of loading was approximately 35 kg./minute.

Prior to the mechanical tests, the samples were stored for a period of two hours at the experimental temperature. Bending tests were also carried out at room temperature (20°C.) after:—

(*a*) Storage at room temperature for 140 days.

(*b*) 2 hours storage at 110°C.

(*c*) 2 hours storage at 200°C.

It is interesting to note that some of the pressed synthetic resins showed improved mechanical strength after treatment (*a*), thus exhibiting an age hardening effect.

Generally speaking, the preliminary storing at elevated temperature ((*b*) and (*c*) above, to ensure the test piece being throughout at the experimental temperature) caused a serious drop in the bending strength at 20°C. and this alteration has to be allowed for in discussing the subsequent experimental results.

Although in every case the bending strength at elevated temperature is less than that at low temperature, the variation is not by any means uniform for the different types of plastics investigated, several of the substances (*e.g.*, synthetic horn) showing a pronounced maximum strength at room temperature. The temperature sensitivity (*i.e.*, per cent. change of bending strength for a temperature interval of 10°C.) over the range −70°C. to 110°C. varies between about 2 per cent. (treated wood) and 10 per cent. (polyvinylchloride) and this necessitates specifying test temperature to a much closer limit than has been the practice hitherto.

The Weldability and Crack Sensitivity of High Duty Alloys as Predicted from the Phase Diagram. (R. Mechel, Zeitsch. Metallk., Vol. 33, No. 5, March, 1941, pp. 205-207.) (100/46 Germany.)

Experiments were carried out on Al sheet of 99.5 per cent. purity containing 0.40 per cent. Si. Welding this material with a welding wire of the same composition invariably led to the formation of welding cracks in the clamped test piece. All tendency to crack however disappeared when a welding wire of Silumin (containing 8 per cent. of Si) was used. The author explains the difference in behaviour by examining mirco photographs of the alloy structure, concluding that in the presence of Si as an impurity (*i.e.*, 0.3 per cent.) precipitation of the latter takes place at the confines of the grains, leading to a reduction in molecular cohesion. In the presence of excess silicon (*i.e.*, if a silumin wire is used), the silicon precipitated from the mixed crystal is added to the primary silicon content. As a result, the silicon is diffused into the basic material and no damage due to isolated precipitation at the grain confines takes place.

The author states that similar considerations to those applicable to simple 2-phase systems can also be applied to the more complicated phases occurring in practice (Al-Cu-Mg, Al-Mg-Si, Al-Zn-Mg alloys).

Details will be given in a subsequent article.

The Mechanical Properties of Wood of Different Moisture Content within $-200°$ *to* $+200°C$. *Temperature Range.* (F. Kollman, V.D.I. Forschungsheft 403, July-August, 1940.) (Translation T.M. 984.) (100/47 Germany.)

The changes in the mechanical properties of wood with temperature are of importance from the biological as well as the technical point of view. Systematic experiments were therefore undertaken with special reference to the effect of gross specific weight (specific weight inclusive of pores) and the moisture content of wood. It was found that the modulus of elasticity of wood at room temperature and frozen at $-8°$ is practically the same. At lower freezing temperatures the drop in Young's modulus with the moisture content is less than at $+20°$.

There is a linear relationship between the compression strength and the temperature of anhydrous wood which remains above $+160°$. The slope of the straight lines is directly proportional to the gross specific weight of the wood. In connection with these tests it was also shown that swelling of wood in liquid air does not occur; the linear heat expansion for fir between $-190°$ and $+20°$ was also computed.

The effect of moisture on the compression strength of frozen wood was accurately explored. The curve has two peaks; one at the boundary between pure surface absorption and capillary condensation, the other at the high moisture content at which a connected " ice lattice " first begins to form in the frozen wood. Theory and experiment are in good agreement in this respect. The decrease in strength by maximum moisture content is derived from the pressure-temperature chart of ice.

The compression strength of 18 species of wood was tested in relation to gross specific weight which included test series for kiln-drying state, for about 10 per cent. moisture content and for complete water saturation and $+20°$ and $-42°$ temperatures. Special importance is attached to the curve of water saturated frozen wood, because the phase diagram of ice itself is affected by its aspect.

The flexural strength of frozen wood was secured on several water-saturated frozen samples. It is about twice as high as the bending strength of the water-saturated wood at room temperature. According to the fracture of a frozen pine sample, the stress distribution is similar to that of wood at room temperature and departs considerably from Navier's rectilinear distribution.

Lastly, the impact strength of frozen laminated wood was investigated, which plainly revealed a decrease with the moisture content in the hygroscopic zone. A new method employing a piezo-electric indicator was developed (32 references).

Factors Influencing the Fatigue Strength of Materials. (F. Bollenrath, L.F.F., Vol. 17, No. 10, Oct. 26th, 1940.) (R.T.P. Translation T.M. 987.) (100/48 Germany.)

A number of factors are considered which influence the static and fatigue strength of materials under practical operating conditions as contrasted with the relations obtaining under the conditions of the usual testing procedure. Such factors are, for example, interruptions in operation, periodically fluctuating stress limits and mean stresses with periodic succession of several groups and stress states, statistical changes and succession of stress limits and mean stress, frictional corrosion at junctures, and notch effects. With the aid of a few examples taken from aircraft construction, it is shown how the materials testing procedure can take such effects into account as to provide the designer with a useful basis for better utilisation of the material. Numerous instructive test results are discussed.

Buckling Tests on Eccentrically Loaded Beam Columns. (J. Cassens, L.F.F., Vol. 17, No. 10, Oct. 26th, 1940.) (R.T.P. Translation T.M. 989.) (100/49 Germany.)

Formulæ are obtained for computing the buckling load of rods eccentrically loaded at each end, the computation being extended in particular to the inelastic range. The test results are graphically presented on three sets of curves. Two of these, at least for the elastic range, are independent of the material tested. The third set, which is independent of the material, possesses greater clearness and is therefore used for comparing the test results with the theoretical. A further chart gives a comparison between the buckling load of an eccentrically loaded open profile and the torsional buckling load of the same profile centrally loaded. For large slenderness ratios the eccentrically loaded rod can sustain a greater load in the axial direction.

Economic Advantages of Certain Aluminium Alloys for Aircraft Construction. (K. F. Thornton, Inst. Aeron. Sci., 10th Annual Meeting, Jan., 1942, pp. 1-21.) (100/52 U.S.A.)

Many aircraft parts, particularly fairings, cowlings, skin covering, etc., are often not intended to carry high stresses. Further, because of the necessity for a certain inherent stiffness or because of handling considerations, it is not always possible to use material as thin as would be permitted by considerations of design stresses alone. With these points in mind it is thought that considerable economic advantage can be gained by the more extensive use of certain lower strength, lower priced and more readily workable materials than the high strength aluminium alloys now generally employed. The aluminium alloys 53S, 61S and A51S possess the desirable characteristics of relative ease of fabrication, inherent resistance to corrosion, adaptability to spot welding and ease of forging when compared with such commonly employed structural alloys as 24S and 14S. Shop procedures may be employed which avoid troublesome distortion of parts as a result of quenching.

Bending and Torsional Design Charts for Round Chrome Molybdenum Tubing. (V. C. Trimarchi, Inst. Aeron. Sci., 10th Annual Meeting, Jan., 1942, pp. 1-12.) (100/53 U.S.A.)

The design data may be used for the design of round chrome molybdenum tubing either in bending or torsion alone, or under combined bending and torsion. The general case of combined bending and torsion is simplified by use of the equivalent moments method and is treated in detail. Several examples illustrating the use of the charts are included. Some recent systematic combined bending and torsion tests on representative tube sites are found to substantiate the design charts saatisfactorily.

It is shown that the allowable maximum normal and shear stresses for combined bending and torsion are slightly higher than the moduli taken from uncombined bending and torsion tests. The design charts presented, in keeping with accepted practice, are based on the moduli of uncombined bending and torsion tests. The agreement between the tests and allowable moments taken from the design charts indicate this method of design to be quite satisfactory.

Margins of safety based on the ratio of allowable to design "equivalent" moments are found to be in good agreement with those found by the stress-ratio method. Therefore, minimum margins of safety may also be determined directly from these design charts.

By using the actual bending and twisting moments in place of *Me* and *Te* values the design charts are also directly applicable to the design of tubes in uncombined bending or torsion.

The Lateral Instability of Unsymmetrical I-Beams. (H. N. Hill, Inst. Aeron. Sci., 10th Annual Meeting, Jan., 1942, pp. 2-17.) (100/54 U.S.A.)

Under certain conditions of loading and restraint, beams may fail by the compression flange buckling sidewise in much the same manner as columns buckle under axial compressive loads. Despite the similarity of the nature of the failure in the beam and the column, the problem of the lateral instability of flanged beams cannot be solved simply by considering the column strength of the compression flange. This approach to the problem neglects one very important element—the torsional stiffness of the beam.

An expression is derived for calculating the critical bending moment at which lateral buckling will occur in an I-beam which is unsymmetrical about the principal axis normal to the web. The expression is derived for the case in which the beam is subjected to pure bending. This problem differs from the similar problem involving the buckling of beams of symmetrical I cross section in that the shear centre of the section does not coincide with the centre of gravity.

Experimental verification of the expression is obtained from the results of tests made to study the lateral buckling of unsymmetrical aluminium alloy I-beams under pure bending.

Effect of Magnetic Field Distribution in Magnetic Inspection. (F. L. Fuller, Inst. Aeron. Sci., 10th Annual Meeting, Jan., 1942, pp. 1-10.) (100/55 U.S.A.)

This paper presents a study of the magnetic field distribution in an eccentrically cylindrical test specimen under various conditions of magnetic flaw inspection. Actual measurements of flux in the thin and thick sections of the specimen are presented which clearly show the existence of magnetic saturation in the thin section when large magnetising currents are employed. This saturation results in high surface leakage and consequently very definite indications of flow line pattern. However, the thick section is unsaturated because of the choking action of the saturated section and no leakage or flow line pattern appears. A method is described for avoiding the saturation of this type of specimen and of producing substantially uniform magnetisation with greater consistency of flaw indication. In addition, this device permits the use of lower magnetising currents. The flux measurements are made by means of two search coils closely wound about the thin and thick sections. The flux is the time integral of the search coil voltage per turn. The two coil voltages are simultaneously impressed on the input terminals of two integrating, vacuum-tube amplifiers whose outputs are recorded by a two-element oscillograph. In this way, the actual flux pulses produced by one operation of the testing machine in the two sections are recorded simultaneously.

Aluminium Alloys for Aircraft. (T. L. Fritzlen, Inst. Aeron. Sci., 10th Annual Meeting, January, 1942, pp. 1-30.) (100/56 U.S.A.)

The manufacture of aluminium from bauxite is discussed briefly as is remelting and casting. The effect of working, alloying, annealing and heat treating is covered to the extent necessary to give a general picture of these factors. Methods used to determine mechanical properties and definitions are given. The temper designations used to identify wrought alloys are explained.

The fabricating procedures, specifications, inspection and uses for (1) sheet and plate, (2) rolled rod, (3) extruded rod, bar and shapes, and (4) tubing are presented in some detail.

Aircraft parts ready for protective coatings or assembly are mentioned as being available to the aircraft manufacturer.

Methods of processing are cited briefly, and the paper concludes with remarks as to general considerations in using aluminium alloys.

The main purpose of this paper is to give the aircraft personnel sufficient knowledge to order intelligently, inspect and work these commodities to the benefit of himself, the supplier and the country.

Tests on Emery Wheels and the Grindability of Metals. (K. Gottwein, Z.V.D.I., Vol. 85, No. 2, 11/1/41, pp. 43-44.) (100/57 Germany.)

The author estimates the relative performance of emery wheels by measuring at regular intervals of 10 seconds the temperature of a steel ring mounted on plastic bushes. The emery wheel is pressed against the ring at a constant pressure and the amount of material removed was estimated from changes in diameter. The wheel characteristic is obtained by plotting change in diameter after 10 seconds against rise in temperatures during the same interval, the figure of merit depending on the steepness of the curve, *i.e.*, lowest temperature rise for maximum abrasion. Wheels of different grain size and different hardness were used and it appears that generally speaking a soft wheel of small grain size is the most efficient for grinding hard steel, provided the wear of the wheel keeps within tolerable limits.

The relative grindability of metals can be estimated with the same apparatus. It is found that the relative order is the same for wheels of different hardness and grain size, provided the wear and " smear " of the wheel are not excessive.

The following is an example of decreasing grindability :—

Steel 70.11 hardened.
Cast iron.
Steel C 35.11.
Alloy steel VCMO 135.
Ball bearing steel GMA.

The Torsional Fatigue Strength of High Tensile Steels. (H. Cornelius and F. Bollenrath, Z.V.D.I., Vol. 86, No. 7-8, 21/2/42, pp. 103-108.) (100/58 Germany.)

Modern aero engine design tends towards the employment of high tensile alloy steels ($>$ 130 kg./mm.^{2}) for crankshafts.

As information on the torsional fatigue strength of such materials is very meagre, the author carried out experiments on two nickel chrome steels, the ultimate tensile of which could be varied between 90 and 170 kg./mm.^{2} by suitable heat treatment.

Both whole and cross drilled cylindrical test pieces were employed (30 mm. diameter and 300 mm. overall length) the surface being carefully ground and polished. For both steels, the torsional fatigue strength of the undrilled sample increased about 20 per cent. as the ultimate tensile was raised from 90 to 130 kg./mm.^{2}. Further increase in tensile from 130 to 170 kg./mm.^{2} caused a reduction of the torsional fatigue of the same amount. The drilled sample on the other hand showed a continuous increase in fatigue strength over the range 90-170 kg./mm.^{2}. It is interesting to note that for the highest tensile, the fatigue strength of drilled and undrilled sample (referred to the effective cross section in each case) is the same (22 kg./mm.^{2} or about one-eighth of the tensile), *i.e.*, the notch effects of the cross bore are no greater than that due to surface defects in the undrilled sample.

From the above it appears that ultra high tensile steels may be of advantage for crankshafts, provided a very high degree of surface finish can be given to the final product.

Hardness and Microstructure Tests on Welds. (Sparagen and Claussen, Weld. J. Suppl., Dec., 1941, pp. 561-602.) (100/59 Great Britain.)

Continuing their review of literature on this subject to July, 1939, the authors discuss hardness of welded joints as it is affected by materials used, welding speed, current and electrode details, plate thickness, preheating, post-heating, carbon content, alloying elements, austenite grain size and weld-quench tests. Hardness as the criterion of weldability is analysed and existing correlations between hardness and tensile properties, bend ductility, microstructure and cracks of welds presented. Some particulars are then given of microstructure and microstructure investigations.

(Abstract supplied by Met.-Vick. Research Dept.)

Contact Resistance in Welding. (Tylecote, Weld. J. Supplt., December, 1941, pp. 591-602.) (100/60 Great Britain.)

The fundamentals of plate-to-plate contact resistance in spot-welding are discussed, and methods and apparatus for its determination examined. After mentioning the " types " of contact area to be encountered, the author analyses initial investigations of surface conditions, and explains how resistance values were obtained by D.C. resistance measurements. The effects of pressure and upset pressure are outlined. A specially devised cathode-ray oscillograph is then described in detail. It contains three gas-focused tubes for measuring respectively the potential drops between the two sheets to be welded, one sheet and an electrode, and the drop across a shunt placed in the electrode holder. Some particulars of the welder are given, and results obtained by welding materials with different surface treatments are analysed.

(Abstract supplied by Met.-Vick. Research Dept.)

Portable Spot Welding. (Mech. World, 23/1/42, p. 83.) (100/61 Great Britain.)

Features of portable spot welding equipment are discussed and one of the main advantages is said to be the possibility of jig-assembling the work without the necessity for limiting the total weight. A Metrovick portable spot welding machine is described, and some particulars of the control equipment given. It contains water-cooled transformer and secondary leads to the welding tongs, and has a special controller equipped with three synchronous mechanical timers. The machine also incorporates " woodpecker control," which is stated to produce very consistent welds and to reduce the deformation of the copper electrode tips.

(Abstract supplied by Met.-Vick. Research Dept.)

Non-Destruction Testing. (Auto. Engr., December, 1941, pp. 448-450.) (100/62 Great Britain.)

Principles of operation and brief outlines of apparatus used in non-destructive methods of testing welds, castings, etc., are given. By placing the rubber-capped cone of a stethoscope against the work whilst the latter is tapped with a hammer, the natural period note of the part can be heard when it is free from defects. Portable tensile testing machines are reviewed. Magnetic and electrical testing methods may be employed, and it is shown how permanent records from the former method may be obtained. Particulars of X- and gamma-ray testing are given, and in explaining the interpretation of radiographs, some industrial X-ray plants are reviewed.

(Abstract supplied by Met.-Vick. Research Dept.)

Statics of Circular-Ring Stiffeners for Monocoque Fuselages. (W. Stieda, L.F.F., Vol. 18, No. 6, 30/6/41, pp. 214-222.) (R.T.P. Translation T.M. 1,004.) (100/63 U.S.A.)

The internal pressure—which is the important factor in the design of stiffeners —gives rise, in the case of the circular cross section, to axial stresses only, which are taken up mainly by the adjacent skin. For a non-circular cross section, on the contrary, the stiffeners under internal pressure must also be designed for bending moments which lead to considerably increased weight.

In the present report, circular-ring stiffeners with constant and variable moments of inertia under the application of external forces are computed, the support given by the adjacent cylindrical fuselage skin being taken into account. For various cases of loading, the bending moments, axial forces, and shear forces for the ring are determined. The methods of Pohl and Wise are used as basis for the computation.

In the present report, the two or three static redundants are determined from Castigliano's law of minimum work of deformation. Cases of arbitrarily variable moment of inertia can be treated without too much computation on the basis of the obtained derivative of the work with respect to the static redundants. A few examples are computed.

As in the papers of Pohl and Wise the eccentricity between the supporting cylinder skin and centre of gravity of the ring section is neglected since, with the usual construction of the fuselage stiffener, only a small error is involved.

Air Supply and Icing Protection of Aircraft Carburettors. (Inter. Avia., No. 801, 31/1/42, pp. 1-5.) (100/64 U.S.A.)

In order to utilise the dynamic pressure of the relative wind, the entry of the air supply must face forward and at the same time the drag must be reduced to a minimum. Two positions for the entry suggest themselves. One, in the nose of the engine cowling behind the propeller roots. The other just above the engine cowling and well to the rear. In either case, the entry section is made oblong, *i.e.*, of relatively small height, as this has been found to reduce both drag and tendency for icing. The air is turned through a sharp right angled bend before entering the carburettor, the auxiliary hot air entry being placed just before the bend. The mixing of the hot air with the rest of the flow requires careful study, since stratification may upset metering characteristics. The right angled bend in front of carburettor is specially chosen to facilitate mixing and prevent the formation of pockets likely to occur in a smooth bend due to separation of flow from wells. The passage connecting air entry with carburettor must be smooth (no projecting nuts!), as projections facilitate ice deposits. For the same reason the bend must be free of guide vanes, although the latter would reduce the pressure loss.

Ice formation is most dangerous if the air is at a temperature of 30°F. and contains small drops of water.

Warm air at entry, a heated throttle and proper design of fuel jets are the usual remedies applied. A considerable amount of experience is required to ensure proper metering characteristics of a normal carburettor under all conditions. Scoop intakes are always likely to produce uneven pressure distributions at critical points in the carburettor and the difficulties are considerably increased under icing conditions. There appears no doubt that direct fuel injection under separate mechanical control presents very great advantages.

French Experiments on Jet Propulsion. (Inter. Avia., No. 800, 22/1/42, p. 10.) (100/65 France.)

The Breguet Aircraft works (Toulouse) are stated to be building an experimental jet propelled aircraft to the designs of engineer R. Leduc. The principle is stated to be similar to that of Campini, but the compressor is driven by a steam turbine (VUIA type) rated at 1,200 h.p. (3,000 r.p.m.), the steam pressure being 130 atmospheres. A model of this machine was exhibited at the Paris Aircraft Show in 1938.

No details of the condenser plant are given, but model experiments appear to have given satisfactory results. It is stated that Leduc took out patents in 1933 covering the use of branch jets from the main driving jet to be used to blow off the boundary layer on the aircraft fuselage and nozzle walls.

The Correction of Engine Output to Standard Conditions. (D. S. Hersey, Inst. Aeron. Sci., 10th Annual Report, Jan., 1942, pp. 1-37.) (100/69 U.S.A.)

In order to provide a common basis for the comparison of high-performance supercharged aircraft engines, formulæ are proposed for correcting the measured output to standard atmospheric conditions.

An investigation of power correction formulæ is needed because the generally used formulæ were developed for naturally aspirated engines and have been found to be inaccurate when applied to supercharged engine test data.

In the development of the proposed correction formulæ, the theoretical effects of atmospheric changes on the performance of an engine's induction system units are discussed and applied in a general basic correction formula. These effects pertaining to each induction system unit are checked by comparing the unit formulæ with test data obtained on a specific engine.

Two engine output correction formulæ, covering both full throttle and part throttle operation of single stage supercharged engines, are then evolved. The accuracy of these formulæ is determined by comparison of calculated engine performance with flight test data taken under various atmospheric conditions. A similar check of the generally used correction formulæ is also made.

A comparison of the old and new full throttle formulæ indicates that former correction errors of as much as ten per cent. may now be reduced to approximately one and one-half per cent. Comparison of the part throttle correction formulæ shows that the accuracy of the rational formula is inferior to that of the generally used formula.

Correction formulæ for two stage supercharged engines of the gear-driven and turbo-driven variety are finally proposed for consideration, but no flight test proof of these latter formulæ is presented.

The Efficiency of Combustion Turbines with Constant Pressure Combustion. (W. Piening, L.F.F., Vol. 17, No. 9, Sept. 20th, 1940.) (R.T.P. Translation T.M. 975.) (100/70 U.S.A.)

The theoretical and true efficiencies of a combustion turbine cycle with constant pressure combustion are computed and discussed for the three case of

1. Adiabatic compression and expansion.
2. Isothermal compression and adiabatic expansion.
3. Isothermal compression and expansion.

The result obtained is that the efficiency depends essentially on the separate efficiencies of the compressor and turbine. Comparison with the type of turbine with explosion combustion shows the advantage lies with the constant pressure combustion turbine. A brief discussion is given finally of the present state of development of compressor, turbine, and accessories in relation to particular features of the combustion turbine process.

Velocity and Pressure in the Curved Vane Passage of Hydraulic Gears. (C. Wieselsberger, Z.V.D.I., Vol. 85, No. 2, 11/1/41, pp. 55-56.) (100/71 Germany.)

Model experiments with air as the working fluid were carried out on the blading constituting 1/6 of the circumference of the guide wheel of a hydraulic gear. This corresponded to five channels of which the central one was used for measurements. The models were made of wood, the blades (cast aluminium) being inserted separately. Great care was taken to ensure a uniform velocity distribution for the air entering the blade passage. Measurements were taken both of the velocity and the pressure of the air across four sections of the blade passage between entry and exit.

By using geometrically similar models of different size and by altering the airspeed, the Reynolds number of the experiments based on mean profile width and airspeed at entry could be varied from 12,500 to 100,000.

It appears that over this range the ratio of velocities at fixed points in any cross section is constant, *i.e.*, the flow distribution is independent of Re. Speaking generally, the direction of flow is practically perpendicular to the normal sections. Friction at the walls produces however a well marked subsidiary flow. Due to curvature of the blades, maximum velocity occurs in the corner formed by the curved upper surface of the blade and the inner rotating surface. A detailed examination of the flow losses will be given in a subsequent paper.

Lubrication Phenomena Between Piston Rings and Cylinder. (R. Poppinge, Z.V.D.I., Vol. 86, No. 7-8, 21/2/42, p. 116.) (Digest.) (100/72 Germany.)

The author investigates the condition of lubrication between piston ring and cylinder by measuring the electrical contact resistance, the corresponding potential difference being recorded on a film by means of a cathode ray oscillograph. The experimental unit consisted of a 90 mm. piston which could be motored between 30 and 800 r.p.m. in an electrically heated cylinder (stroke 120 mm.), whilst the gas pressure in the head could be varied between 0 and 50 atmospheres. Two gas rings and one scraper ring were fitted, the contact pressure of which could be varied. Lubrication was carried out by means of holes along the cylinder circumference. The tests show that at low speeds, the lubrication is of the mixed type towards the ends of the stroke, whilst at the stroke mid point (highest piston speed) there is a marked tendency towards fluid lubrication.

The breakdown of the oil film at the dead centre position is practically independent of ring pressure and this corresponds with the practical observation that the wear is unaffected by fitting so called high tension rings. Gas pressure affects the breakdown of the film only at low speeds. It appears that at high speeds, the time lag in the gas pressure behind the rings causes the pressure effect to be delayed towards the middle of the stroke, when it can be taken up by the fluid film which generally exists over this portion of the cylinder. As is to be expected, the breakdown of the oil film is considerably affected by the cylinder well temperature. A small rise in temperature (up to 80°C.) facilitates metallic contact. At higher temperatures, however, the fluid film seemed to reform.

Evidently the relationship is very complex.

Change in the rate of oil supply did not appear to affect the phenomena.

The author concludes that a biconical shape of the piston rings is beneficial in building up the oil film over the central stroke sections.

The Compression Process in Centrifugal Superchargers as Affected by Gas Friction. (C. Pfleiderer, L.F.F., Vol. 19, No. 1, 20/1/42, pp. 13-22.) (100/74 Germany.)

The passage of the gas through a centrifugal compressor is necessarily accompanied by friction which causes an additional temperature rise. As a result, the gas characteristic becomes a polytrope of which the index n is greater than γ.

The author has constructed a diagram which enables both the index n and the preparation of extra work to be determined for a given pressure ratio and overall temperature efficiency. The investigation is then extended to cover multi-stage compressors. Of special interest is the method adopted for converting experimental characteristics obtained under given conditions to allow for (*a*) change in intake temperature, (*b*) addition of extra stages (speed, intake temperature and nature of gas unchanged), (*c*) change in speed at constant intake temperature. In the latter case the effect of separation of the flow (break away) receives detailed attention.

Regeneration of Used Lubricating Oils. (K. Thomas, Z.V.D.I., Vol. 85, No. 2, 11/1/41, pp. 33-39.) (100/75 Germany.)

Prior to the war the consumption of lubricating oil for German transport engines amounted to about 100,000 tons a year, excluding oil used by the army. About one-third of these requirements were met by regeneration of used oil.

The author describes the five principal stages of regeneration, viz.:

1. Separation of deposits including water and sludge by filtration;
2. Sulphuric acid treatment;

3. Neutralisation and preliminary bleach;
4. Distillation of neutral oil in vacuum;
5. Final bleach and filtration;

together with the control tests.

It is stated that the regenerated oil is fully equivalent to fresh oil and will give identical service. Obviously the regenerative treatment will vary with the nature and employment of the original oils, and thus transformer oils, machine tool oils and engine oils will require separate collection and treatment. In this connection the provision of special tank waggons calling at works and garages throughout the country has been found well worth while, as this saves the needless transit of metal containers to the refinery.

In the author's opinion, the proportion of regenerated oil available to the industry will rise, as the organisation of collecting centres and provision of special refineries is extended.

International Petrol Supply. (Inter. Avia., No. 806, 9/3/42, pp. 16-17.) (100/76 Switzerland.)

In 1938 the world's total production of petroleum (crudes) amounted to 271×10^6 tons, made up as follows (in 10^6 tons):—

170	U.S.A.
34	Central America.
29	U.S.S.R.
15	Near and Middle East.
10	Far East.
8	Europe.
5	South America.

In the same year, the world's tanker fleet amounted to 11×10^6 tons, owned as follows (in 10^6 tons):—

3.3	U.S.A.
3.0	British Empire.
2.8	Norway, Holland, Belgium, Denmark.
1.0	Germany, Italy, Japan.
0.8	France, Spain, Sweden.
0.1	U.S.S.R.

In 1939, the increase in tanker tonnage was estimated at about 650,000 tons. Since the outbreak of the war, the Germans claim to have sunk 2.5×10^6 tanker tonnage.

Knock Rating by Acoustical Methods. (P. Funk, A.T.Z., Vol. 45, No. 2, 25/1/42, pp. 21-25.) (100/77 Germany.)

The method developed consists in recording the sound emitted from the engine when operating under different conditions. For this purpose a piezo electrical device is employed which is attached to the engine cylinder and transmits the sound waves in the form of electrical changes of potential to a cathode ray oscillograph.

Special electrical filters ensure that the background of mechanical noise is reduced to a low level, whilst the high frequency notes accompanying detonations are amplified.

The oscillograph response can be either examined by eye or recorded photographically on a stroke or time basis. For routine knock rating the E.M.F. curve can be still further amplified and comparative values read off on a millivolt meter, a thermotransformer being employed in the circuit as a damping element.

The acoustical method has the advantage of requiring no modification to the test engine, since the device can be clamped to any convenient part of the cylinder. It is thus equally suitable for single and multi-cylinder engines. By taking records on a time basis (continuous film) the distribution of the knock intensity over the various cylinders can be followed. At the same time the sensitivity is such that disturbances in the combustion can be detected before audible knock arises. A portable form of the device enables measurements to be carried out on the road or in flight.

Octane Rating in Multi-Cylinder Engines. (A. W. Schmidt, A.T.Z., Vol. 45, No. 2, 25/1/42, pp. 26-31.) (100/78 Germany.)

The author applies the acoustical method of knock rating (described in 100/77) to multi-cylinder engines and shows that the tendency to knock may be very different in the various cylinders. The reasons for this difference in behaviour are investigated and it is shown that both ignition timing, compression ratio and mixture strength may differ appreciably from cylinder to cylinder.

Even if these factors are controlled, there is evidence that the order of merit or relative rating of a series of fuels will be different, depending on the particular cylinder chosen for the comparison. Apart from temperature effects inside the cylinder the author suggests distillation phenomena in the induction pipe as possible causes. This is being investigated further.

The Automatic Radio Compass. (W. L. Webb and G. O. Essex, Inst. Aeron. Sci., 10th Annual Meeting, January, 1942, pp. 1/30.) (100/79 U.S.A.)

The automatic radio compass is an important aid to the navigation of modern aircraft. The main advantages are that radio bearings are quickly obtained in flight, and that the azimuth direction of the radio signal is continuously indicated. The equipment consists of a combination of radio, electrical, and mechanical apparatus which actuates a bearing indicator when a known radio signal is tuned in. When direct ground observations cannot be made, the use of a calibrated automatic radio compass aids the pilot in heading towards a given radio station and also in establishing his position relative to two or more radio stations.

Further advantages are obtained by using a dual radio compass installation to operate two concentric pointers provided on a single azimuth indicator. A direct line between two radio stations may be flown without the aid of other navigational instruments. Location problems are simplified since the directions of two radio stations are simultaneously indicated relative to the heading of the aircraft.

A combination of an automatic radio compass and a remote indicating magnetic compass has been developed so that the magnetic bearing of the radio station is indicated directly. This eliminates the necessity of determining the magnetic heading of the aircraft by a separate observation, and provides the pilot with a means of flying an infinite number of lines toward or away from a given radio station.

Electrical Characteristics of Stroboscopic Flash Lamps. (Murphy and Edgerton, J. App. Phys., December, 1941, pp. 848-855.) (100/80 Great Britain.)

This paper describes the electrical characteristics of gas-filled discharge tubes when flashed by a condenser discharge. The object of the experiments was to determine the effects of tube dimensions, pressure, voltage, and capacity upon the performance. The results are stated to be of an experimental nature and cover a limited range of values of tubes and circuit constants. An empirical constant called tube resistance is defined and evaluated. This constant is said to be useful in predicting the performance of tubes in electrical circuits.

(Abstract supplied by Met.-Vick. Research Dept.)

Thermochrome Temperature Measuring Crayons. (F. Penzig, Z.V.D.I., Vol. 85, No. 2, 11/1/41, p. 48.) (100/81 Germany.)

The use of temperature sensitive paints for thermal investigation is by now well known. The author describes a new development in the form of crayons by means of which discrete points on the body under investigation can be conveniently marked. By this means it became readily possible to ensure that every point of a complicated die has reached the requisite temperature and that the preheating of the material before welding has been carried out properly. Other fields of application cover extrusion processes, heat insulators, ovens, etc.

The temperature corresponding to the colour change is accurate to within ±5°C. Crayons for the following critical temperatures are available:—

Temperature °C.	Initial Colour.	Final Colour.
120	light green	blue
150	green	violet
200	blue	black
300	green	brown
350	brown	red
450	pink	black
510	light yellow	orange
600	dark blue	white

Brilliance Control of Aircraft Instrument Lights. (J. Aeron. Sci. (Rev. Sect.), Vol. 9, No. 3, Jan., 1942, p. 62.) (100/82 U.S.A.)

Before the aircraft pilot is a score or more of indicator lights. If they are bright enough to be clearly distinguished as on or off during a bright day they will blind him at night if he shifts his gaze from the inky blackness outside to the cockpit. One remedy has been to control the brilliance by inserting resistance into the circuit, but this has required rheostats as bulky and heavy as the lamps themselves.

A method of brilliance control developed by Westinghouse adds neither weight nor bulk to a crowded instrument or radio control board. Two layers of Polaroid are placed between the bulb and the lens; one is fixed in position, the other can be rotated by turning the lens. The stationary Polaroid screen polarises the light in the horizontal direction; it blocks all light waves from the lamp except the horizontal. The rotable Polaroid can be oriented to allow the horizontally polarised light to come through or, when turned 90 degrees, to block them. Thus the pilot can obtain from the indicator light any brilliance from full brightness to almost complete darkness by simply rotating a collar on the indicator.

The Transmission of Light in the Atmosphere with Application to Aviation. (H. G. Houghton, J. Aeron. Sci., Vol. 9, No. 3, Jan., 1942, pp. 103-107.) (100/83 U.S.A.)

The transmission of light through the atmosphere is determined by the absorption and scattering which it suffers. It is shown that absorption is negligible in the visible spectrum, but becomes increasingly strong in the infra-red. Scattering is due to suspended particles ranging in size from the air molecules to rain drops. The scattering coefficient changes with the wave length, or colour, of the light only when the scattering particles are smaller than the wavelength. Since the suspensoids which produce low visibility are large compared to the wavelength of visible light and the near infra-red, no advantage results from the use of coloured lights or the infra-red in such cases. Photography in the near infra-red is useful in cases when the visibility is limited by small particle haze.

Theory shows that the visual range is determined largely by the scattering coefficient of the atmosphere. Since it is often difficult to select suitable marks for the estimation of the visual range, it is suggested that an instrument be developed for determining the scattering coefficient.

Industrial Research in the U.S.S.R. during 1941. (Ind. and Eng. Chem. (New Ed.), Vol. 20, No. 2, 25/1/42, pp. 100-102.) (100/84 U.S.S.R.)

The American review covers a vast range of subjects on which the Soviets have done original work.

The following represents a small selection:—

(1) Boron carbide is about 50 per cent. as abrasive as diamond dust.
(2) Gum formation in cracked petrols is inhibited by the addition of 0.065 per cent beech tar or 0.01 per cent. phenyl or tolyl-p-amnio phenol.
(3) An aluminium alloy (A N 2.5) containing 2.5 per cent. Ni forms a substitute for high tin babbitt.
(4) Corrosion resistant Zu-Mg alloys are in the region corresponding to chemical combination → pure zinc.
(5) Copper zirconium alloys are recommended for electrical equipment subjected to high temperatures.
(6) Vulcanisation of rubber by means of high frequency electric currents yields an improved product.
(7) Experiments are in progress to produce plastics from sea weed.
(8) Explosive properties of nitrogen chloride are being investigated.

Industrial Research in Germany during 1941. (Ind. and Eng. Chem. (News Ed.), Vol. 20, No. 2, 25/1/42, pp. 91-96.) (100/85 Germany.)

The following represents a selection of matters of interest dealt with in this American review:—

(1) Large smokescreen installation for protection of industrial areas against aircraft attack.
(2) German crude oil production during 1941 estimated at 50×10^6 barrels (40×10^6 from Roumania) and 37×10^6 barrels of synthetic fuel.
(3) An improved motor fuel has been obtained by heating benzene for several hours in an autoclave at 20 to 25 atmospheres.
(4) Acetyl benzoyl is a good accelerator for Diesel fuel oils.
(5) Reinforced concrete tanks with a plastic lining are utilised for storage.
(6) Cementation of glass plates to a transparent plastic is facilitated by the application of high frequency currents.
(7) Cerium and other metals of the rare earth group are proposed as a replacement for Al in thermite incendiary fillings.
These metals are also used in the construction of tracer shells.

LIST OF SELECTED TRANSLATIONS.

No. 43.

NOTE.—Applications for the loan of copies of translations mentioned below should be addressed to the Secretary (R.T.P.3), Ministry of Aircraft Production, and not to the Royal Aeronautical Society. Copies will be loaned as far as availability of stocks permits. Suggestions concerning new translations will be considered in relation to general interest and facilities available.

Lists of selected translations have appeared in this publication since September, 1938.

ARMAMENT AND THEORY OF WARFARE.

TRANSLATION NUMBER AND AUTHOR		TITLE AND JOURNAL.
1400	——	*Some Japanese Proposals for Fighter Aircraft.* (Der Flieger, Vol. 20, No. 7, July, 1941, p. 225.)
1405	Zuerl, W.	*The Air Power of the East—Japan.* (Der Flieger, Vol. 20, No. 7, July, 1941, p. 225.)
1418	Stroyev, M. P.	*Tactical Requirements in Fighter Design.* (Aeron. Eng., U.S.S.R., Vol. 17, No. 12, Dec., 1940, pp. 18-24.)

AERO AND HYDRODYNAMICS.

1409	Gebelein, H.	*Experiments on the Flow in the Entry Length of a Square Tunnel.* (Z.V.D.I., Vol. 94, No. 15, 13/4/40, p. 259.)
1410	Hausen, H.	*Pressure Drop and Heat Transfer in the Case of Turbulent Non-Isothermal Flow.* (Z.V.D.I., Vol. 84, No. 15, 13/4/40, 258-259.)

SUPERSONICS.

1399	Wolff, H. Cordes	*Influence on the Mach Number on Airscrew Efficiency (Discussion).* (L.F.F., Vol. 18, No. 9, 20/9/41, pp. 338-339.)
1407	Ferri, A.	*Experiments at Supersonic Speed on a Biplane of the Busemann Type.* (Atti di Guidonia, No. 37-38, 10/11/40, pp. 317-357.)

AIRCRAFT AND ACCESSORIES.

1402	Zudakin	*Hot Air Stove for Engine Warming Up (Type APL-1).* (Oborongiz Publication, Moscow, Oct., 1940.)
1403	——	*Wind Tunnel Research on the Ksoll Wing.* (Flugsport, Vol. 30, No. 23, pp. 129-132, and No. 24, pp. 133-134.)
1416	——	*Spring Legs for Aircraft (Patent No. 708,026).* (Flugsport, Vol. 33, No. 16, 6/8/41, p. 40.)
1420	Dornier	*Tailbrake for Aircraft.* (German Specification No. 705,891.)

PRODUCTION.

TRANSLATION NUMBER AND AUTHOR.		TITLE AND JOURNAL.
1396	Renner, K.	*Properties of Magnesium Alloys as Affecting Design and Fabrication.* (Luftwissen, Vol. 8, No. 7, July, 1941, pp. 218-223, and No. 8, Aug., 1941, pp. 251-255.)
1408	Lo	*Efficient Design.* (Luftwissen, Vol. 8, No. 2, Feb., 1941, pp. 48-49.)

VIBRATION AND FATIGUE.

1395	Gassner, E.	*Wohler Diagrams for Cylindrical Specimens Made of Cr-Mo-Steel, Duralumin, Hydronalium and Electron.* (Luftwissen, Vol. 8, No. 3, March, 1941, pp. 82-85.)
1398	Meyer	*The Coupling of the Flexural Vibrations of an Airscrew with the Torsional Vibrations of a Crankshaft.* (L.F.F., Jahrbuch, 1938.) (Translated by Rolls-Royce, Ltd. Edited by R.T.P.3.)
1401	Zellet, W.	*Properties of Buna Rubber for Application in the Technique of Vibration.* (Z.V.D.I., Vol. 85, No. 39-40, 4/10/41, p. 806.)
1415	Gassner, E.	*Strength of Investigations in Aircraft Construction Under Repeated Application of the Load.* (Luftwissen, Vol. 6, No. 2, Feb., 1939, pp. 61-64.)

GAS TURBINES.

1404	Kubsch, E.	*The Working Process of the Exhaust Driven Turbine when Applied to the Operation of Centrifugal Superchargers.* (A.T.Z., Vol. 43, No. 4, 25/2/1940, pp. 77-84.)
1414	Stodola	*Performance Tests on an Internal Combustion Gas Turbine.* (Z.V.D.I., Vol. 84, No. 1, 6/1/40, p. —.)

GERMAN SPECIFICATIONS (MATERIAL NUMBERS).

1413	——	*German Aircraft Materials Specification Sheets.* (Flugwerkstoff-Handbook.)
1424	——	*German Specification Sheets (Covering Certain Light Alloys).* (Flugwerkstoff-Handbook.)

TITLES AND REFERENCES OF ARTICLES AND PAPERS SELECTED FROM PUBLICATIONS RECEIVED IN R.T.P.3 DURING JANUARY, 1942.

Notices and abstracts from the Scientific and Technical Press are prepared primarily for the information of Scientific and Technical Staffs. Particular attention is paid to the work carried out in foreign countries, on the assumption that the more accessible British work (for example, that published by the Aeronautical Research Committee) is already known to these Staffs.

Detailed Classification of Principal Items.

Theory and Practice of Warfare. (1-157.)

(*a*) *Military Types of Aircraft* (*Bombers and Fighters*).

- Great Britain.—1, 2, 3, 4, 7, 15, 16, 23, 29, 30, 38, 45, 50, 60, 62, 65, 69, 83, 91, 97, 98, 99, 102, 106, 154, 155, 157.
- U.S.A.—5, 9, 10, 13, 18, 19, 20, 21, 22, 26, 46, 58, 64, 66, 68, 76, 109, 110, 111.
- U.S.S.R.—24, 27, 28, 32, 33, 35, 63, 77.
- Germany.—6, 36, 44, 70, 71, 72, 73, 75, 79, 92, 95, 100, 104, 108, 145, 148.
- Italy.—39, 40, 47.
- Japan.—25, 74, 142.
- Sweden.—43.

(*b*) *Trainers.*

- Great Britain.—149.
- Germany.—53.
- U.S.A.—89, 90, 112.

(*c*) *Dive Bombers.*

- U.S.A.—96.
- Sweden.—42.
- U.S.S.R.—34, 67.

(*d*) *Gliders.*

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(*e*) *Armament, including Bombs and Accessories.*

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THEORY AND PRACTICE OF WARFARE.

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
1	479	Great Britain	*Handley Page Halifax.* (Airc. Eng., Vol. 14, No. 155, Jan., 1942, pp. 12-13 and 15.)
2	482	Great Britain	*Avro Manchester.* (Airc. Eng., Vol. 14, No. 155, Jan., 1942, pp. 16-17.)
3	487	Great Britain	*Short Stirling (Photograph).* (Aeroplane, Vol. 62, No. 1,600, 23/1/42, pp. 86 and 92.)
4	488	Great Britain	*Armstrong Whitley V (Photograph).* (Aeroplane, Vol. 62, No. 1,600, 23/1/42, p. 88.)
5	491	U.S.A. ...	*Consolidated Catalina (Photograph).* (Aeroplane, Vol. 62, No. 1,600, 23/1/42, p. 101.)
6	492	Germany ...	*German Aeroplanes in Service XXIII (The Klemm Series).* (Aeroplane, Vol. 62, No. 1,600, 23/1/42, p. 110.)
7	498	Great Britain	*Beaufort Dropping Torpedo (Photograph).* (Flight, Vol. 41, No. 1,726, 22/1/42, p. 64.)
8	500	U.S.A. ...	*America's New Aircraft Carriers.* (Flight, Vol. 41, No. 1,726, 22/1/42, pp. 68-70.)
9	502	U.S.A. ...	*Douglas Devastator (Torpedo Bomber) (Photograph).* (Flight, Vol. 41, No. 1,726, 22/1/42, p. 68.)
10	503	U.S.A. ...	*Grumman Wildcats and U.S. Navy Vindicator on Deck of U.S.S. Ranger (Photograph).* (Flight, Vol. 41, No. 1,726, 22/1/42, p. 70.)
11	504	U.S.S.R. ...	*Russia's A.T.C. (Ossoaviakhim).* (Flight, Vol. 41, No. 1,726, 22/1/42, pp. a-c.)
12	506	Great Britain/Germany ...	*Recognition Details (Miles Magister and Ju. 87B).* (Flight, Vol. 41, No. 1,726, 22/1/42, p. g.)
13	521	U.S.A. ...	*Bell Airacobra I.* (Autom. Ind., Vol. 85, No. 12, 15/12/41, p. 38.)
14	528	Great Britain	*Luminous Paint for A.R.P. Purposes.* (Nature, Vol. 149, No. 3,769, 24/1/42, p. 106.)
15	539	Great Britain	*Short Stirling Heavy Bomber.* (The Engineer, Vol. 173, No. 4,490, 30/1/42, pp. 95-97.)
16	545	Great Britain	*New British Types.* (Der Flieger, Vol. 20, No. 11, Nov., 1941, pp. 305-307.)
17	547	Germany ...	*The Role of the N.S. Flying Corps in the War.* (Der Flieger, Vol. 20, No. 11, Nov., 1941, p. 365.)
18	549	U.S.A. ...	*Vought Sikorsky V.S. 44A Flying Boat (Photograph).* (U.S. Air Services, Vol. 26, No. 12, Dec., 1941, p. 10.)
19	550	U.S.A. ...	*North American Mustang Fighter (Photograph).* (U.S. Air Services, Vol. 26, No. 12, Dec., 1941, p. 13.)
20	551	U.S.A. ...	*North American B.25 Medium Bomber (Photograph).* (U.S. Air Services, Vol. 26, No. 12, Dec., 1941, p. 13.)
21	552	U.S.A. ...	*Martin Mars Patrol Bomber (Photograph).* (U.S. Air Services, Vol. 26, No. 12, Dec., 1941, p. 16.)
22	553	U.S.A. ...	*Curtiss P40F Fighter.* (U.S. Air Services, Vol. 26, No. 12, Dec., 1941, p. 27.)
23	558	Great Britain	*Short Stirling Bomber.* (Flight, Vol. 41, No. 1,727, 29/1/42, pp. 94-109, 86.)

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24	559	U.S.S.R. ...	*Russian Twin-Engined Bomber P.E.*2 (*Photograph*). (Flight, Vol. 41, No. 1,727, 29/1/42, p. 89.)
25	560	Japan ...	*Mitsubishi* 96 (*Photograph*). (Flight, Vol. 41, No. 1,727, 29/1/42, p. 88.)
26	561	U.S.A. ...	*The Manta Long Range Fighter.* (Flight, Vol. 41, No. 1,727, 29/1/42, p. d.)
27	562	U.S.S.R. ...	*Russian Fighters I*-26 *and I*-61 (*Photograph*). (Flight, Vol. 41, No. 1,727, 29/1/42, p. h.)
28	563	U.S.S.R. ...	*Russian Air Power.* (Flight, Vol. 41, No. 1,727, 29/1/42, pp. e-93.)
29	564	Great Britain	*Short Stirling* (*Photograph*). (Aeroplane, Vol. 62, No. 1,601, 30/1/42, p. 115.)
30	565	Great Britain	*Vickers Armstrong Wellington* (*Photograph*). (Aeroplane, Vol. 62, No. 1,601, 30/1/42, p. 116.)
31	566	Japan ...	*Japanese Account of the Attack on Pearl Harbour.* (Aeroplane, Vol. 62, No. 1,601, 30/1/42, p. 116.)
32	567	U.S.S.R. ...	*Russian YAK*-4 (*B.B.*22) *Fighter-Bomber* (*Photograph*). (Aeroplane, Vol. 62, No. 1,601, 30/1/42, p. 116.)
33	568	U.S.S.R. ...	*Russian P.E.*-2 *Bomber* (*Photographs*). (Aeroplane, Vol. 62, No. 1,601, 30/1/42, pp. 118-119.)
34	569	U.S.S.R. ...	*Russian IL*-2*c* (*Stormovik*) (*Photograph*). (Aeroplane, Vol. 62, No. 1,601, 30/1/42, p. 120.)
35	570	U.S.S.R. ...	*Russian SU*-2 (*B.B.*1) *Single Engine Bomber* (*Photograph*). (Aeroplane, Vol. 62, No. 1,601, 30/1/42, p. 120.)
36	571	Germany ...	*German Aeroplanes in Service XXIV* (*Klemm and Messerschmitt Series*). (Aeroplane, Vol. 62, No. 1,601, 30/1/42, p. 138.)
37	572	Great Britain/ Germany ...	*Aircraft Recognition* (*Fieseler* (*Fi.* 156*K*) *Storch and Westland Lysander*). (Aeroplane, Vol. 62, No. 1,601, 30/1/42, pp. 124-125.)
38	574	Great Britain	*Short Stirling.* (Aeroplane, Vol. 62, No. 1,601, 30/1/42, pp. 133-135.)
39	578	Italy ...	*New Italian Fighters Re.* 2001. (Inter. Avia., No. 787-788, 30/10/41, p. 7.)
40	579	Italy ...	*New Italian Bombers P.*108, *SM.*84, *Ca.*313. (Inter. Avia., No. 787-788, 30/10/41, p. 7.)
41	582	Italy ...	*Jet Propulson Applied to Bombs* (*Armour Piercing*). (Inter. Avia., No. 787-788, 30/10/41, p. 8.)
42	585	Sweden ...	*Svenska B*17 (*Dive Bomber*). (Inter. Avia., No. 787-788, 30/10/41, pp. 9-10.)
43	586	Sweden ...	*Svenska S*17 (*Reconnaissance*). (Inter. Avia., No. 787-788, 30/10/41, pp. 9-10.)
44	589	Germany ...	*Messerschmitt Me.*209. (Inter. Avia., No. 787-788, 30/10/41, p. 11.)
45	590	Great Britain	*Blackburn Botha I.* (Inter. Avia., No. 787-788, 30/10/41, p. 12.)
46	591	U.S.A. ...	*Long Range Patrol Bomber Martin XPB*2*M*-1. (Inter. Avia., No. 787-788, 30/10/41, p. 12.)
47	592	Italy ...	*Fiat Seaplane Bomber Fiat R.S.*14 (*Photograph*). (Inter. Avia., No. 787-788, 30/10/41, p. II.)
48	593	Switzerland ...	*On High Speed Fighters.* (Inter. Avia., No. 792, 28/11/41, pp. 1-6.) (Abstract available.)

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
49	596	Great Britain	*British Views on Airacobra I and II.* (Inter. Avia., No. 792, 28/11/41, pp. 13-14.)
50	597	Great Britain	*Avro "Manchester."* (Inter. Avia., No. 792, 28/11/41, p. 14.)
51	599	Great Britain	*Hurricane Adapted to Low Altitude Bombing.* (Inter. Avia., No. 792, 28/11/41, p. 15.)
52	602	Germany	*Military Air Transport.* (Inter. Avia., No. 792, 28/11/41, p. 19.) (Abstract available.)
53	604	Germany	*Bucker Bestmann Bu.*181 *Trainer* (105 *h.p.*). (Flugsport, Vol. 34, No. 1, 7/1/42, pp. 3-6.)
54	607	Germany	*High Performance Gliders List of References.* (Flugsport, Vol. 34, No. 1, 7/1/42, p. 13.)
55	612	Germany	*Aircraft Gun Mounting* (*Pat. No.* 713,680). Ikaria, Flugsport, Vol. 34, No. 1 (Pat. Coll. No. 20), 7/1/42, pp. 81-82.)
56	637	U.S.S.R.	*Civil Aviation Co-operation in Russian War Effort.* (L. Zacharoff, Aviation, Vol. 40, No. 11, Nov., 1941, pp. 50-51, 184-186.)
57	647	Germany	*Design Details of Wing and Fuselage of Me.*110. (Aviation, Vol. 40, No. 11, Nov., 1941, pp. 90-91.)
58	649	U.S.A.	*Martin XPB2M*-1 (*Photograph*). (Aviation, Vol. 40, No. 11, Nov., 1941, p. 109.)
59	654	Great Britain	*Bomber Crews.* (Aviation, Vol. 40, No. 11, Nov., 1941, pp. 52-53, 140, 142 and 144.)
60	691	Great Britain	*Short Stirling Heavy Bomber II.* (Engineer, Vol. 173, No. 4,491, 6/2/42, pp. 113-114.)
61	692	Germany	*The Structure of German Aeroplanes.* (Engineer, Vol. 173, No. 4,491, 6/2/42, pp. 125-127.)
62	693	Great Britain	*Short Stirling Heavy Bomber.* (Engineering, Vol. 153, No. 3,969, 6/2/42, pp. 107-108 and 110.)
63	708	U.S.S.R.	*Russian D.B.*3 *Medium Bomber* (*Photograph*). (Aeroplane, Vol. 62, No. 1,602, 6/2/42, p. 145.)
64	709	U.S.A.	*Boeing* 314*A "Bristol"* (*Photograph*). (Aeroplane, Vol. 62, No. 1,602, 6/2/42, pp. 144, 163-165.)
65	710	Great Britain	*Boulton Paul Defiant* (*Photograph*). (Aeroplane, Vol. 62, No. 1,602, 6/2/42, pp. 146 and 160.)
66	711	U.S.A.	*Curtiss Kittyhawk* (*Photograph*). (Aeroplane, Vol. 62, No. 1,602, 6/2/42, p. 146.)
67	712	U.S.S.R.	*Russian S.B.-R.K. Dive Bomber* (*Photograph*). (Aeroplane, Vol. 62, No. 1,602, 6/2/42, p. 147.)
68	713	U.S.A.	*Martin B*26 *Marauder* (*Photograph*). (Aeroplane, Vol. 62, No. 1,602, 6/2/42, p. 149.)
69	714	Great Britain	*Hawker Hurricane II* (*Photograph*). (Aeroplane, Vol. 62, No. 1,602, 6/2/42, p. 150.)
70	715	Germany	*Dornier Do.*215 (*Photograph*). (Aeroplane, Vol. 62, No. 1,602, 6/2/42, p. 151.)
71	716	Germany	*Dornier Do.*26*K Flying Boat* (*Photograph*). (Aeroplane, Vol. 62, No. 1,602, 6/2/42, p. 151.)
72	717	Germany	*Me.*109*E and Me.*109*F.* (Aeroplane, Vol. 62, No. 1,602, 6/2/42, pp. 152-153.)
73	718	Germany	*Junkers Ju.*88 *A*6. (Aeroplane, Vol. 62, No. 1,602, 6/2/42, p. 154.)
74	719	Japan	*Japanese Military Aircraft* (*Mitsubishi* 96, 97, 98*I and Kawanishi* 94). (Aeroplane, Vol. 62, No. 1,602, 6/2/42, p. 155.)

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
75	720	Germany	*German Aeroplanes in Service XXV (Messerschmitt Series).* (Aeroplane, Vol. 62, No. 1,602, 6/2/42, p. 161.)
76	722	U.S.A.	*Boeing 314A.* (Flight, Vol. 41, No. 1,728, 5/2/42, p. 111.)
77	723	U.S.S.R.	*Russian Twin-Engined Bomber PE2 (Photograph).* (Flight, Vol. 41, No. 1,728, 5/2/42, p. 113.)
78	724	Germany	*German Dual Purposes A.A. Gun Carriers.* (Flight, Vol. 41, No. 1,728, 5/2/42, p. d.)
79	727	Germany	*Me.109F and Me.109E.* (Flight, Vol. 41, No. 1,728, 5/2/42, pp. 115-120.)
80	771	Germany	*The Testing of Lightning Conductors fitted to Explosive Stores.* (F. Fritsch, Z.G.S.S., Vol. 37, No. 1, Jan., 1942, pp. 1-5.)
81	772	Germany	*Calculation of General Ballistic Trajectories in the Presence of a Tangential Resistance.* (L. Ottsen, Z.G.S.S., Vol. 37, No. 1, Jan., 1942, pp. 5-7.)
82	773	Germany	*How Far are Technical Achievements of the Present War Based on Experience Gained in the 1914-1918 War—Prize Competition Sponsored by the German War Office.* (Z.G.S.S., Vol. 37, No. 1, Jan., 1942, p. 9.)
83	807	Great Britain	*Boulton Paul "Defiant" Two-Seat Fighter.* (Engineer, Vol. 173, No. 4,492, 13/2/42, pp. 144-146.)
84	808	Great Britain	*Visual A.R.P. System.* (Engineer, Vol. 173, No. 4,492, 13/2/42, p. 147.)
85	809	U.S.A.	*The War and Aircraft Maintenance.* (R. C. Stunkel, Aviation, Vol. 40, No. 12, Dec., 1941, pp. 58-59 and 204.)
86	811	U.S.A.	*Air Corps Equipment for Field Servicing.* (Aviation, Vol. 40, No. 12, Dec., 1941, pp. 62-63 and 166.)
87	812	U.S.A.	*Douglas DB-7 (Details of Tail and Nose Wheel).* (Aviation, Vol. 40, No. 12, Dec., 1941, p. 120.)
88	813	U.S.A.	*Servicing of American Aircraft Equipment Abroad.* (Aviation, Vol. 40, No. 12, Dec., 1941, pp. 70 and 182.)
89	814	U.S.A.	*Curtiss AT-9 Twin-Engined Trainer.* (Aviation, Vol. 40, No. 12, Dec., 1941, p. 110.)
90	817	U.S.A.	*"Morrow" Plywood Trainer.* (Aviation, Vol. 40, No. 12, Dec., 1941, p. 107.)
91	824	Great Britain	*Boulton Paul "Defiant" Night Fighter.* (Flight, Vol. 41, No. 1,729, 12/2/42, pp. 132-135, 128.)
92	826	Germany	*Dornier Do.217E.* Flight, Vol. 41, No. 1,729, 12/2/42, p. f.)
93	828	Great Britain	*Halifax Gun Turret Installation (Photograph).* (Flight, Vol. 41, No. 1,729, 12/2/42, p. 137.)
94	829	U.S.A.	*Crating of North American Mustang for Shipment to Great Britain (Photograph).* (Flight, Vol. 41, No. 1,729, 12/2/42, p. 137.)
95	830	Germany	*Junkers Ju.88 A6.* (Flight, Vol. 41, No. 1,729, 12/2/42, pp. 138-141.)
96	831	U.S.A.	*Vultee Vengeance Dive Bomber (Photograph).* (Flight, Vol. 41, No. 1,729, 12/2/42, p. 144.)

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97	832	Great Britain	*Handley Page Hampden with Engine Tents (Photograph).* Flight, Vol. 41, No. 1,729, 12/2/42, p. 146.)
98	833	Great Britain	*Boulton Paul "Defiant" Assembly Line (Photograph).* (Aeroplane, Vol. 62, No. 1,603, 13/2/42, p. 172.)
99	834	Great Britain	*Handley Page Halifax II (Photograph).* (Aeroplane, Vol. 62, No. 1,603, 13/2/42, p. 174.)
100	835	Germany ...	*Blohm and Voss Ha.*138*B (Photograph).* (Aeroplane, Vol. 62, No. 1,603, 13/2/42, p. 175.)
101	836	Germany ...	*German Troop Carrying Gliders (Photograph).* (Aeroplane, Vol. 62, No. 1,603, 13/2/42, p. 176.)
102	837	Great Britain	*Short Stirling (Photograph).* (Aeroplane, Vol. 62, No. 1,603, 13/2/42, p. 180.)
103	838	Germany ...	*German Aeroplane Design Features I (Wing Structures Do.*17, *He.*111*K, Ju.*87*B and Ju.*88, *Me.*109 *and* 110). (Aeroplane, Vol. 62, No. 1,603, 13/2/42, pp. 180a-182.)
104	839	Germany ...	*Dornier Do.*217*E*1. (Aeroplane, Vol. 62, No. 1,603, 13/2/42, p. 183.)
105	840	Great Britain	*Bristol Beaufort Bomb Racks (Photograph).* (Aero-Plane, Vol. 62, No. 1,603, 13/2/42, p. 184.)
106	841	Great Britain	*Boulton Paul Defiant I.* (Aeroplane, Vol. 62, No. 1,603, 13/2/42, pp. 188-189.)
107	842	Germany/ U.S.A. ...	*Focke Wulf F.W.*189 *and Lockheed P*38 *(Recognition Details).* (Aeroplane, Vol. 62, No. 1,603, 13/2/42, pp. 190-191.)
108	843	Germany ...	*German Aeroplanes in Service (XXVI) (Siebel Aircraft).* (Aeroplane, Vol. 62, No. 1,603, 13/2/42, p. 194.)
109	844	U.S.A. ...	*Curtiss Hawk P-*40*F (Photograph).* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 112.)
110	854	U.S.A. ...	*" Mustang " Single-Seat Fighter (Photograph).* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 178.)
111	857	U.S.A. ...	*Vought Sikorsky VS-*44 *Long Range Flying Boat.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 224-227.)
112	859	U.S.A. ...	*The " Morrow " Plywood Trainer.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 231 and 235.)
113	861	U.S.A. ...	*Armoured Power Rheostat (Dimming Lights on Instrument Panels).* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 255.)
114	863	U.S.A. ...	*Application of Plexiglass to Bomber Construction.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 239-240.)
115	867	U.S.A. ...	*Bullet Proof Fuel Hose.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 248.)
116	872	U.S.A. ...	*Transparent Plastic for Bomber Nose Section.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 259.)
117	876	U.S.A. ...	*The Question of a Separate Air Force.* (Cy. Caldwell, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 70-74.)

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118	884	Great Britain	*Shatter Proof Plastics for Pressure Cockpits.* (British Plastics, Vol. 13, No. 152, Jan., 1941, p. 259.)
119	903	Great Britain	*Probability Applied to Shooting.* (W. E. Hick, Aeronautics, Vol. 5, No. 6, Jan., 1942, pp. 32-34.)
120	907	Germany ...	*Luftwaffe Equipment.* (Aeronautics, Vol. 5, No. 6, Jan., 1942, p. 69.)
121	908	U.S.A. ...	*History of Naval Aviation (U.S.A.).* (J. B. Hancock, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 30-33, and 218.)
122	909	U.S.A. ...	*Naval Operations and Aviation.* (H. R. Stark, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 28, 194.)
123	910	U.S.A. ...	*The Bureau of Aeronautics (U.S.A. Naval Air Arm).* (J. H. Towers, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 34 and 182.)
124	911	U.S.A. ...	*Aviation and the Navy.* (F. Knox, Flying and Popular Aviation, Vol. 30, No 1, Jan., 1942, pp. 25, 220.
125	912	U.S.A. ...	*The Patrol Bomber (Naval Air Arm).* (J. S. McCain, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 52-56.)
126	913	U.S.A. ...	*The Fighter (Naval Air Arm).* (J. B. Pearson, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 38-62, 218.)
127	914	U.S.A. ...	*The Torpedo Plane (Naval Air Arm).* (S. Teller, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 64-66, 224.)
128	915	U.S.A. ...	*The Scout Bomber (Naval Air Arm).* (J. N. Murphy, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 68-70, 192-194.)
129	916	U.S.A. ...	*Observation and Scouting (Naval Air Arm).* (M. K. Fleming, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 72-75, 252.)
130	917	U.S.A. ...	*Utility Plane (Cargo and Transport) (Naval Air Arm).* (C. T. Durgin, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 76-78, 246.)
131	918	U.S.A. ...	*Naval Aviation Training (Naval Air Arm).* (A. C. Read, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 80-84, 212-214.)
132	919	U.S.A. ...	*The Marines (Naval Air Arm).* (R. J. Mitchell, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 86-90, 244.)
133	920	U.S.A. ...	*The Naval Flight Surgeon (Naval Air Arm).* (J. R. Poffen, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 91-93.)
134	921	U.S.A. ...	*Naval Airships (Naval Air Arm).* (S. E. Peck, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 94-98.)
135	922	U.S.A. ...	*The Aircraft Carrier.* (W. F. Halsey, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 115-120, 164.)

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136	925	U.S.A. ...	*Maintenance.* (N. H. Schaeffer, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 132-135 and 186.)
137	926	U.S.A. ...	*Armament.* (W. F. Boone, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 136-138, 238-242.)
138	931	U.S.A. ...	*The Naval Air Station.* (B. Marrell, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 150-153, 196.)
139	933	U.S.A. ...	*Coastguard Planes.* (R. R. Waesche, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 122-127, 254-257.)
140	934	U.S.A. ...	*Identification Silhouettes and Designation Code.* (Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 160-164 and 257.)
141	935	U.S.A. ...	*New Plane Names for the U.S.A.* (Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 232.)
142	945	Japan ...	*The Japanese Air Force.* (E. Hostettler, Flugwehr und Technik, Vol. 4, No. 1, Jan., 1942, pp. 5-6.)
143	946	Switzerland ...	*Aerial Attacks on Warships.* (T. Weber, Flugwehr und Technik, Vol. 4, No. 1, Jan., 1942, pp. 7-10.)
144	956	Germany ...	*German Aircraft Structures (Fuselages).* (Aeroplane, Vol. 62, No. 1,604, 20/2/42, pp. 207-209.)
145	958	Germany ...	*German Aeroplanes in Service XXVII (Blohm and Voss, Dornier, Fieseler, Gotha Gliders, Henschel).* (Aeroplane, Vol. 62, No. 1,604, 20/2/42, p. 217.)
146	960	Great Britain	*Whitley and Manchester—Identification Details.* (Flight, Vol. 41, No. 1,730, 19/2/42, p. b.)
147	961	Great Britain	*British Four-Engined Aircraft Development.* (Flight, Vol. 41, No. 1,730, 19/2/42, pp. c-15.)
148	963	Germany ...	*New Types of German Aircraft on the Russian Front.* (Flight, Vol. 41, No. 1,730, 19/2/42, p. 160.)
149	964	Great Britain	*Miles Master III Trainer.* (Flight, Vol. 41, No. 1,730, 19/2/42, p. 162.)
150	965	U.S.A. ...	*Rear Gun Installation on B25 Bomber.* (Flight, Vol. 41, No. 1,730, 19/2/42, p. 166.)
151	966	Great Britain	*Kite Balloons on Ships (Photograph).* (Flight, Vol. 41, No. 1,730, 19/2/42, p. 167.)
152	967	U.S.A. ...	*Naval Aircraft Factory 12-Seater Glider Project.* (American Av., Vol. 5, No. 16, 15/1/42, p. 32.)
153	972	Italy ...	*Smoke Screens (from the Italian).* (L. P. Pardo, Aeronautics, Vol. 6, No. 1, Feb., 1942, pp. 52-54.)
154	974	Great Britain	*Four-Engined Bombers (Halifax, Stirling).* (Aeronautics, Vol. 6, No. 1, Feb., 1942, pp. 64-69.)
155	975	Great Britain	*Avro Manchester (Photograph).* (Aeronautics, Vol. 6, No. 1, Feb., 1942, p. 74.)
156	976	U.S.S.R. ...	*Tactical Requirements of Fighter Designs (Reprint of R.T.P. 93/2—U.S.S.R.).* (M. P. Stroyer, Aeronautics, Vol. 6, No. 1, Feb., 1942, pp. 61-63.)
157	977	Great Britain	*Boulton Paul Defiant.* (Engineer, Vol. 173, No. 4,493, 20/2/42, pp. 156-158.)

AERODYNAMICS AND HYDRODYNAMICS.

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
158	466	France ...	*Note on the Thermal Effects Accompanying the Displacement of a Solid in a Fluid.* (E. Brun, Comptes Rendus, Vol. 212, No. 20, 19/4/41, pp. 843-845.) (Abstract available.)
159	467	France ...	*On the Effect of the Slipstream of Two Counter Rotating Airscrews arranged in Tandem on the Lift of the Complete Aircraft and the Efficiency of the Propellers.* (R. Silbur, Comptes Rendus, Vol. 212, No. 20, 19/4/41, pp. 845-848.) (Abstract available.)
160	511	Germany ...	*Force Measurements on Slotted Profile under Cavitation (from the Japanese).* (F. Numachi, W.R.H., Vol. 22, No. 20, 15/10/41, pp. 295-299.)
161	523	Great Britain	*The Pressure Wave System in the Periodic Flow of Liquid in a Pipe.* (R. S. Silver, Phil. Mag., Vol. 33, No. 216, Jan., 1942, pp. 15-24.)
162	525	Great Britain	*Steady Flow of Ground Water to a Pumped Well in the Vicinity of a River.* (N. S. Boulton, Phil. Mag., Vol. 33, No. 216, Jan., 1942, pp. 34-50.)
163	526	Great Britain	*The Influence of Diffusion on the Propagation of Shock Waves.* (T. G. Cowling, Phil. Mag., Vol. 33, No. 216, Jan., 1942, pp. 61-67.)
164	608	Germany ...	*Boundary Layer Research in U.S.A. and Great Britain.* (Flugsport, Vol. 34, No. 1, 7/1/42 (Profile Collection No. 35), pp. 141-144.)
165	619	Switzerland ...	*Determination of Cavitation Factor by Air Tests.* (C. Keller and H. Blenber, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 19-24.)
166	621	Switzerland ...	*Flow Phenomena in Hydraulic Butterfly Valves subjected to Cavitation.* (H. Blenber, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 31-35.)
167	623	Switzerland ...	*Scale Effect with Tests at Varying Pressure.* (A. Pfenninger, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 41-43.)
168	673	U.S.A. ...	*Rapid Formation of Gas Bubbles in Liquids.* (W. G. Eversob and others, Ind. and Eng. Chem. (Ind. Ed.), Vol. 33, No. 11, Nov., 1941, pp. 1,459-1,462.)
169	701	U.S.A. ...	*Three Dimensional Flutter Analysis.* (W. M. Blackney, J. Aeron. Sci., Vol. 9, No. 2, Dec., 1941, pp. 56-63.) (Abstract available.)
170	702	U.S.A. ...	*On the Reaction of an Elastic Wing to Vertical Gusts.* (W. R. Sears and B. O. Sparks, J. Aeron. Sci., Vol. 9, No. 2, Dec., 1941, pp. 64-67.) (Abstract available.)
171	779	Great Britain	*Mechanism of Kinetic Flutter.* (J. R. Bristow, Nature, Vol. 149, No. 3,771, 7/2/42, pp. 169-170.)
172	803	Great Britain	*Aerodynamics of Steam Turbine Blades.* (Engineering, Vol. 153, No. 3,970, 13/2/42, p. 132.)
173	804	Great Britain	*Wind Tunnel Experiments on Model Reaction Turbine.* (M. R. Youssef, Engineering, Vol. 153, No. 3,970, 13/2/42, pp. 138-140.) (Abstract available.)

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174	845	U.S.A. ...	*Power Requirements for Wind Tunnel Models.* (C. C. Clynne, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 197, 227.)
175	885	Great Britain	*Corresponding Problems in Periodic and Steady Flow.* (G. Green, Phil. Mag., Vol. 33, No. 217, Feb., 1942, pp. 102-114.)
176	902	Great Britain	*The Measurement of Air Speed.* (E. B. Mass, Aeronautics, Vol. 5, No. 6, Jan., 1942, pp. 27-27.)
177	948	Switzerland ...	*Lectures on Aerodynamic and Aeronautical Engineering at the E.T.H., Zurich (Laminar Flow, Supersonics, Jet Propulsion and Belt Drives).* (Flugwehr und Technik, Vol. 4, No. 1, Jan., 1942, pp. 21-22.) (Abstract available.)
178	973	Great Britain	*The Effect of the Ground on Aeroplanes.* (R. H. Warring, Aeronautics, Vol. 6, No. 1, Feb., 1942, pp. 55-57.)

AIRCRAFT AND AIRSCREWS.

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
179	477	U.S.A. ...	*Balancing of Airscrews (from Aero Digest, U.S.A.).* (R. K. Mueller, Airc. Eng., Vol. 14, No. 155, Jan., 1942, pp. 9-11.)
180	481	Great Britain	*D.H. Four-Bladed Airscrew.* (Airc. Eng., Vol. 14, No. 155, Jan., 1942, pp. 14-15.)
181	483	Great Britain	*Helicopter Design.* (J. Lockwood Taylor, Airc. Eng., Vol. 14, No. 155, Jan., 1942, p. 18.)
182	495	U.S.A. ...	*Brake Drums (from the U.S.A.).* (Autom. Eng., Vol. 32, No. 419, Jan., 1942, pp. 23-27.)
183	499	Great Britain	*Airscrew Terminology.* (R. C. Molloy, Flight, Vol. 41, No. 1,726, 22/1/42, p. 78.)
184	501	Great Britain	*Airscrew Blade Materials.* (K. B. Gillmore, Flight, Vol. 41, No. 1,726, 22/1/42, p. 80.)
185	518	U.S.A. ...	*Testing Propellers at the Hamilton Laboratories.* (N. B. Pope, Autom. Ind., Vol. 85, No. 12, 15/12/41, pp. 30-33, 67.)
186	546	Germany ...	*The Balancing of Airscrews, Pt. II (Dynamic and Aerodynamic Balancing).* (Der Flieger, Vol. 20, No. 11, Nov., 1941, pp. 359-361.)
187	581	Italy ...	*New Italian Transports, Cant Z.*511 *and P.*108. (Inter. Avia., No. 787-788, 30/10/41, p. 8.)
188	583	Great Britain	*Flat Rim Nose Wheel Tyre (Photograph).* (Inter. Avia., No. 787-788, 30/10/41, p. 1.)
189	587	France ...	*Potez Skan* 161 *Flying Boat.* (Inter. Avia., No. 787-788, 30/10/41, p. 10.)
190	588	France ...	*S.E.*200 *(Six-Engined Flying Boat).* (Inter. Avia., No. 787-788, 30/10/41, p. 10.)
191	594	U.S.A. ...	*Northrop Tailless Aircraft.* (Inter. Avia., No. 792, 28/11/41, pp. 11-12.)
192	595	U.S.A. ...	*American Liaison Planes (Stinson, Taylorcraft, Aeronca).* (Inter. Avia., No. 792, 28/11/41, p. 12.)
193	598	Great Britain	*De-icing Equipment on British Bomber.* (Inter. Avia., No. 792, 28/11/41, p. 15.)
194	603	Germany ...	*Single Seat Light Aircraft La.*11*W (with Floats).* (Flugsport, Vol. 34, No. 1, 7/1/42, pp. 2-3.)
195	609	Germany ...	*Fuselage with Pressure Cabin (Pat. No.* 714,018). (Messrschmitt, Flugsport, Vol. 34, No. 1, (Pat. Coll. No. 20), 7/1/42, p. 81.)

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196	610	Germany	*Slotted Flap* (*Pat. No.* 714,000). (Junkers, Flugsport, Vol. 34, No. 1 (Pat. Coll. No. 20), 7/1/42, p. 81.)
197	611	Germany	*Automatic Safety Devices for Elevator Operation* (*Pat. No.* 713,841). (Fieseler, Flugsport, Vol. 34, No. 1 (Pat. Coll. No. 20), 7/1/42, p. 81.)
198	613	Germany	*Built-up Box Girder for Snow Skids* (*Pat. No.* 714,002). (Heine, Flugsport, Vol. 34, No. 1 (Pat. Coll. No. 20), 7/1/42, pp. 82-83.)
199	616	Germany	*Test Rig for Testing Complete Aircraft on the Ground* (*Pat. No.* 712,936). (Junkers, Flugsport, Vol. 34, No. 1 (Pat. Coll. No. 20), 7/1/42, p. 84.)
200	618	Switzerland	*Tests Concerning Development of Var. Pitch Marine Propellers.* (H. Gerber, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 51-60.)
201	627	Switzerland	*Investigation of Stresses in a V.P. Airscrew.* (F. Salzmann and A. v. d. Muhl, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 60-65.)
202	639	U.S.A.	*Scientific Control of Trans-Ocean Flight.* (J. C. Leslie, Aviation, Vol. 40, No. 11, Nov., 1941, pp. 58-59, 188-192.)
203	640	U.S.A.	*Aircraft Hydraulic Pumps.* (H. J. Marx and E. M. Greer, Aviation, Vol. 40, No. 11, Nov., 1941, pp. 60-62, 172-176.)
204	642	U.S.A.	*New Runways by Soil Cement.* (Aviation, Vol. 40, No. 11, Nov., 1941, pp. 69-70.)
205	644	U.S.A.	*The "Langley" Plastic Plane.* (R. Hawthorne, Aviation, Vol. 40, No. 11, Nov., 1941, pp. 72-73, 162-168.)
206	645	U.S.A.	*Aircraft Control Cables.* (R. F. Kolder, Aviation, Vol. 40, No. 11, Nov., 1941, pp. 78-79 and 170.)
207	726	Great Britain	*Asymmetrical Aircraft.* (Flight, Vol. 41, No. 1,728, 5/2/42, p. h.)
208	795	Great Britain	*Some Unusual Operations on Hamilton Airscrews.* (Machinery, Vol. 59, No. 1,525, 1/1/42, pp. 393-397.)
209	815	U.S.A.	*Northrop "All Wing" Aeroplane.* (J. K. Northrop, Aviation, Vol. 40, No. 12, Dec., 1941, pp. 82-83, 184 and 202.)
210	816	U.S.A.	*Wollam Plywood Float.* (Aviation, Vol. 40, No. 12, Dec., 1941, p. 123.)
211	820	U.S.A.	*Metal Mat Runways.* (Aviation, Vol. 40, No. 12, Dec., 1941, p. 140.)
212	851	U.S.A.	*The Theory of the Turn* (*Aircraft Control Operation*). (L. F. Motl, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 210-214.)
213	853	U.S.A.	*Stress Department of North American Aircraft.* (R. L. Schleicher, Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 192.)
214	862	U.S.A.	*Aircraft Control Bearings with Dual Inner Races.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 239.)
215	864	U.S.A.	*New Structural System for Aircraft Hangars* (*Diagrid*). (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 240.)

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216	865	U.S.A.	*Air Heated Wind Shields (for De-icing).* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 245.)
217	868	U.S.A.	*Plywood Skis for Light Planes.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 248.)
218	874	U.S.A.	*Sealing Glands for High Pressure Hydraulic System.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 264.)
219	878	U.S.A.	*The Design of Propeller Blade Roots.* (G. Cordes, L.F.F., Vol. 18, No. 4, April 22nd, 1942, pp. 128-134.) (Available as Translation T.M. 1,001.) (Abstract available.)
220	888	U.S.A.	*Remedies for Induction System Icing.* (A. A. Brown, S.A.E.J., Vol. 50, No. 1, Jan., 1942, p. 22.) (Abstract available.)
221	890	U.S.A.	*Two Control Planes ("The Skyfarer").* (O. C. Koppen, S.A.E.J., Vol. 50, No. 1, Jan., 1942, p. 23.) (Abstract available.)
222	906	Great Britain	*Development of Aircraft Hangars.* (L. B. Dyball, Aeronautics, Vol. 5, No. 6, Jan., 1942, pp. 58-61.)
223	949	Japan	*The Vibration and Sound of a Revolving Thin Plate (Airscrew Flutter).* (J. Obata and others, Aeron. Res. Inst., Tokio, Vol. 16, No. 206, April, 1941, pp. 129-163.) (Abstract available.)
224	957	Great Britain	*Tailless Aircraft.* (Aeroplane, Vol. 62, No. 1,604, 20/2/42, pp. 210-211.)
225	962	Great Britain	*Simplified Cruising Control (Constant B.M.E.P. Operation).* (A. A. Barrie and J. B. Cutting, Flight, Vol. 41, No. 1,730, 19/2/42, pp. 156-159.)
226	968	U.S.A.	*Water Absorption by Aircraft Due to Rain.* (American Av., Vol. 5, No. 16, 15/1/42, p. 34.)
227	988	Great Britain	*Aerodrome Abstracts, Nos.* 1-13. (Compiled by Road Research Laboratory, Vol. 1, No. 1, 1942.)

ENGINES AND ACCESSORIES.

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228	489	Germany	*Research in Germany (Engine and Aircraft).* (Aeroplane, Vol. 62, No. 1,600, 23/1/42, p. 94.)
229	490	U.S.A.	*Development of the Allison Aero Motor III.* (R. M. Hazen, Aeroplane, Vol. 62, No. 1,600, 23/1/42, pp. 98-99.)
230	496	U.S.A.	*Wankesha-Hesselman Engine.* (Autom. Eng., Vol. 32, No. 419, Jan., 1942, pp. 33-34.)
231	507	Germany	*Supercharger, Part II (R.T.P. Translation No.* 1,367). (W. V. D. Null and H. Pfan, Flight, Vol. 41, No. 1,726, 22/1/42, pp. h-75.)
232	541	Great Britain	*The Future of the Railway Oil Engine.* (The Engineer, Vol. 173, No. 4,490, 30/1/42, p. 104.)
233	573	U.S.A.	*Development of the Allison Aero Motor, IV.* (R. M. Hazen, Aeroplane, Vol. 62, No. 1,601, 30/1/42, pp. 126-127.)
234	575	Switzerland	*Methods of Balancing Axial Thrust of High Pressure Centrifugal Water Pumps.* (K. Rutschi, Schwiez Bauz, Vol. 117, No. 16, 19/4/41, pp. 176-177.) (Abstract available.)

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235	576	Switzerland ...	*Tank Evacuation by Means of Rotary Vacuum Pumps (Formulæ and Experiments).* (T. Brenni, Schweiz Bauz, Vol. 116, 27/7/40.)
236	577	Switzerland ...	*Gas Turbine Tests.* (A. Stodola, Schweiz Bauz, Vol. 115, 13/1/40, pp. 13-21.)
237	580	Italy ...	*Campini Jet Propulsion.* (Inter. Avia., No. 787-788, 30/10/41, pp. 7-8.)
238	584	Italy ...	*Isotta Fraschini "Gamma" In-Line Aero Motor* (700 *h.p.*). (Inter. Avia., No. 787-788, 30/10/41, p. 8.)
239	614	Germany ...	*Mobile Stoves for Warming-Up Engines or Cockpits (Pat. No.* 712,883). (Boye, Flugsport, Vol. 34, No. 1 (Pat. Coll. No. 20), 7/1/42, p. 84.)
240	617	Switzerland ...	*Research on Turbo Machinery.* (C. Keller, Turbo Machinery, Escher Wyss, Res. Pub., 1939, pp. 2-16.)
241	620	Switzerland ...	*Results of Research in the Construction of Water Turbines.* (E. Seitz, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 25-31.)
242	622	Switzerland ...	*Tests on Turbo Pumps (Hydraulic).* (H. C. V. Widden, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 36-40.)
243	625	Switzerland ...	*Modern Turbo Compressors.* (B. Lendorff, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 47-52.)
244	626	Switzerland ...	*Elements of Fundamental Research on Axial Flow Fans.* (C. Keller, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 52-57.)
245	628	Switzerland ...	*Research on the Utilisation of Vacuum of Condensing Turbines.* (H. Bollier, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 71-76.)
246	629	Switzerland ...	*Research on Constituent Elementary Parts of Steam Turbines.* (F. Salzmann, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 76-81.)
247	630	Switzerland ...	*An Aerodynamic Heat Power Plant.* (J. Ackeret and C. Keller, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 82-85.)
248	633	Germany ...	*A Novel Single Jet Carburettor.* (A.T.Z., Vol. 44, No. 21, 10/11/41, pp. 537-539.)
249	676	U.S.A. ...	*Manufacture of Roots Superchargers for Transport Engines by McCulloch Eng. Co.).* J. Geschelin, Autom. Ind., Vol. 86, No. 1, 1/1/42, pp. 18-24 and 74.)
250	721	U.S.A. ...	*Relative Merits of British and American Aircraft and Engines (from the U.S.A..).* (E. Warner, Flight, Vol. 41, No. 1,728, 5/2/42, p. 110.)
251	742	U.S.A. ...	*Hydraulic Transmission for Throttle Operation, etc. (Transmitter and Receiver Move Same Distances and are Self-Synchronising).* (Instruments, Vol. 14, No. 10, Oct., 1941, p. 319.)
252	754	Great Britain	*Practical Solution of Torsional Vibration Problems. (W. Ker Wilson, Chapman and Hall,* 42/-.) *(Book Review.)* (Nature, Vol. 149, No. 3,770, 31/1/42, p. 124.)

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253	763	Great Britain	*Recent Development in Turbine Technique.* (Alton Engineering and Boiler House Review, Jan., 1942, *pp.* 226-232.) (Met. Vick. Tech. News Bull., No. 799, 30/1/42, p. 3.) (Abstract available.)
254	768	U.S.A.	*A New Theory of Combustion in Diesel Engines.* (M. G. Fiedler, J. Frank. Inst., Vol. 233, No. 1, Jan., 1942, pp. 17-39.)
255	776	Great Britain	*Production of Bristol Hercules Aero Engine.* (Machinery, Vol. 60, No. 528, 22/1/42, pp. 1-9.)
256	805	Great Britain	*Turbine Blades.* (Engineering, Vol. 153, No. 3,970, 13/2/42.)
257	819	U.S.A.	*Laboratory Control for Materials and Manufacturing Process of Ranger Engines.* (C. B. F. Macauley, Aviation, Vol. 40, No. 12, Dec., 1941, pp. 108-109 and 190-192.)
258	823	U.S.A.	*Air Filters for Aero Engines.* (W. K. Gregory, Aviation, Vol. 40, No. 12, Dec., 1941, pp. 115 and 206-208.)
259	847	U.S.A.	*Precision Machining Operation on the Cyclone* 14 *Crankshaft.* (J. F. McCarthy, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 198-202, 228.)
260	879	Great Britain	*The Axial Engine.* (C. B. Redrup, Autom. Eng., Vol. 32, No. 420, Feb., 1942, pp. 49-50.)
261	881	Great Britain	*Oil Filters (Fundamentals of Designs).* (Autom. Eng., Vol. 32, No. 420, Feb., 1942, p. 61.)
262	883	Great Britain	*Al. Bronze Sprayed with Steel as a Material for Engine Sleeve Valves (Pat. No.* 535,981*).* (H. R. Ricardo and J. F. Alcock, Autom. Eng., Vol. 32, No. 420, Feb., 1942, p. 79.)
263	891	U.S.A.	*Cooling Characteristics of Submerged Light Aircraft Engines.* (H. H. Ellerbrock, Transactions S.A.E.J., Vol. 50, No. 1, Jan., 1942, pp. 7-14.) (Abstract available.)
264	898	Germany	*Light Alloy Cylinder Heads for Motor Car Engines.* (M. Rassenbeck, A.T.Z., Vol. 44, No. 24, 25/12/41, pp. 607-612.)
265	899	Germany	*Development of High Duty Pistons Based on Modern Researches on Heat Flow.* (F. Josslan, A.T.Z., Vol. 44, No. 24, 25/12/41, pp. 613-617.) (Abstract available.)
266	900	Germany	*The Measurement of Piston Temperatures (Spark Ignition and Diesel Engines).* (I. Kuhn, A.T.Z., Vol. 44, No. 24, 25/12/41, pp. 617-620.) (Abstract available.)
267	901	Germany	*Variation of Specific Fuel Consumption of Non-Supercharged Engines with Altitude.* (W. Fadinger, A.T.Z., Vol. 44, No. 24, 25/12/41, p. 632.) (Abstract available.)
268	927	U.S.A.	*The Power Plant.* (R. Botta, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 139-140, 200, 236.)
269	955	Great Britain	*Engine Tents for Winter Parking (Photographs).* (Aeroplane, Vol. 62, No. 1,604, 20/2/42, p. 203.)

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270	959	Italy/Germany	*Jet Propulsion* (*Campini and Heinkel System*). (G. Geoffry Smith, Flight, Vol. 41, No. 1,730, 19/2/42, pp. 153-154.)
271	983	Great Britain	*Pitting of Gudgeon Pins.* (Engineer, Vol. 173, No. 4,493, 20/2/42, p. 170.)
272	984	Germany ...	*Exhaust Turbo Superchargers for Aero Engines.* (W. von der Null, Z.V.D.I., Vol. 85, No. 43-44, 1/11/41, pp. 847-857.) (Abstract available.)
273	987	Germany ...	*Fatigue Investigation on Dural Connecting Rods* (*as Fitted to the Bucker 80 h.p. Light Aircraft Engines*). (E. v. Rojakovies, Z.V.D.I., Vol. 85, No. 43-4, 1/11/41, pp. 867-868.) (Abstract available.)

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ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
274	517	U.S.A. ...	*Perspective Breakdown Illustration System Speeds Production.* (G. Tharrett, Autom. Ind., Vol. 85, No. 12, 15/12/41.)
275	540	Great Britain	*Technique of Quality Controls* (*Statistical Methods in Engineering Practice*). (The Engineer, Vol. 173, No. 4,490, 30/1/42, pp. 100-102.)
276	601	Germany ...	*Price Policy Giving Requirements of the German Armed Forces.* (Inter. Avia., No. 792, 28/11/41, p. 16.) (Abstract available.)
277	606	Germany ...	*Device for Taking Kinks Out of Tube Bends* (*Pressure Operated*). (Junkers, Flugsport, Vol. 34, No. 1, 7/1/42, pp. 7-8.)
278	635	Great Britain	*Controls for Typical Hydraulic Circuits* (*Machine Tools*). (P. N. Oberholtzer, The Machinist, Vol. 85, No. 43, 17/1/42, pp. 318-319.)
279	636	U.S.A. ...	*Air Defence Progress* (*Production Estimates*). (T. P. Wright, Aviation, Vol. 40, No. 11, Nov., 1941, pp. 46-47, 180-182.)
280	638	U.S.A. ...	*Female Labour in Vultee Factory.* (W. G. Tuttle, Aviation, Vol. 40, No. 11, Nov., 1941, pp. 54-55, 182 and 186.)
281	662	Great Britain	*Industrial Efficiency and the Technical Press.* (Light Metals, Vol. 4, No. 48, Jan., 1942, pp. 251-252.)
282	679	U.S.A. ...	*West Coast Aeroplane Plants* (*Lockheed, Vega, N.A. Vultee*). (J. Geschelin, Autom. Ind., Vol. 86, No. 1, 1/1/42, pp. 32-39, 76-78.)
283	777	Great Britain	*Honing of Oleo Cylinders.* (Machinery, Vol. 60, No. 1,528, 22/1/42, pp. 11-12.)
284	783	Great Britain	*Novel Construction of Windowless Aircraft Factories* (*Glass Fibre and Prefabricated Steel Panels* (*U.S.A.*). (Machinery, Vol. 60, No. 1,530, 5/2/42, p. 65.)
285	794	Great Britain	*A Production Control System by Means of Charts.* (Machinery, Vol. 59, No. 1,525, 1/1/42, pp. 389-392.)
286	796	Great Britain	*Inspection versus Production.* (Machinery, Vol. 59, No. 1,525, 1/1/42, p. 406.)

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287	846	U.S.A.	*Hydraulic Systems Installation—Part II, The Power Circuit.* (J. E. Thompson and R. B. Campbell, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 130-136 and 278.)
288	848	U.S.A.	*Facilitating Production by Tooling Engineering.* (C. H. Speck, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 140-144, 222.)
289	849	U.S.A.	*Mass Production of Vultee Dive Bombers (Vultee).* (Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 205-209.)
290	856	U.S.A.	*Lofting Problems of Streamline Bodies.* (C. M. Hartley and R. A. Liming, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 184-190 and 283.)
291	866	U.S.A.	*Engraving and Marking Tool (Vibrating Principle).* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 248.)
292	869	U.S.A.	*Plastic Hammers for Aircraft Manufacturing.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 251.)
293	896	Great Britain	*Industrial Application of Infra Red Radiation.* (A. E. Tooke and H. W. C. Gatehouse, Electrical Review, Vol. 130, No. 3,349, 30/1/42, pp. 137-141.)
294	904	U.S.S.R.	*U.S.S.R. Aircraft Industry and Flying Equipment.* (Aeronautics, Vol. 5, No. 6, Jan., 1942, p. 41.)
295	905	Great Britain	*Time and Motion Study (Industrial Psychology).* (G. H. G. Garbett, Aeronautics, Vol. 5, No. 6, Jan., 1942, pp. 55-57.)
296	924	U.S.A.	*The Naval Aircraft Factory.* (E. M. Pace, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 128-131, 208.)
297	928	U.S.A.	*Procurement and Production.* (W. W. Webster, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1941, pp. 141-142, 166-168.)
298	969	U.S.A.	*High Speed Developing and Printing Machines for Engineering Drawings.* (American Av., Vol. 5, No. 16, 15/1/42, p. 34.)
299	981	Great Britain	*Electric Tool Tipper.* (Engineer, Vol. 173, No. 4,493, 20/2/42, pp. 168-169.)
300	982	Great Britain	*Automatic Bulkhead Ring Bending Machine.* (Engineer, Vol. 173, No. 4,493, 20/2/42, p. 169.)

FUELS AND LUBRICANTS.

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
301	470	Great Britain	*Fuel Research Intelligence Section. Summary for Weeks Ending 20th and 27th, Dec.,* 1941.
302	471	Great Britain	*Fuel Research Intelligence Section. Summary for Weeks Ending 3rd and 10th Jan.,* 1942.
303	485	Great Britain	*The Oiliness of Lubricants (Publ. Scient. Technique, No.* 169.) (F. Charron, Airc. Eng., Vol. 14, Vol. 155, Jan., 1942, p. 22.)
304	514	Great Britain	*Fuel Research Intelligence Section.* (*Summary for Weeks Ending 17th and 24th Jan.,* 1942.)
305	631	Germany	*On the Present State of Detonation Research (with Bibliography).* (F. Dreyhaupt, A.T.Z., Vol. 44, No. 21, 10/11/41, pp. 522-533.)

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306	632	Germany ...	*The Methane Gas Filling Station at Stuttgart.* (W. Ryssel, A.T.Z., Vol. 44, No. 21, 10/11/41, pp. 534-536.)
307	634	Germany ...	*Ammonia / Acetylene Mixtures for Transport Vehicles.* (A.T.Z., Vol. 44, No. 21, 10/11/41, pp. 540-541.)
308	656	U.S.A. ...	*Prediction of Octane Numbers and Lead Susceptibilities of Gasoline Blends.* (Du Bois Eastman, Ind. and Eng. Chem. (Ind. Ed.), Vol. 33, No. 12, Dec., 1941, pp. 1,555-1,560.) (Abstract available.)
309	668	U.S.A. ...	*Extreme Pressure Lubricants.* (G. L. Simard, Ind. and Eng. Chem. (Ind. Ed.), Vol. 33, No. 11, Nov., 1941, pp. 1,352-1,359.)
310	669	U.S.A. ...	*Response of Aircraft Fuels to Tetraethyllead.* (A. G. Cattane and A. L. Stanly, Ind. and Eng. Chem. (Ind. Ed.), Vol. 33, No. 11, Nov., 1941, pp. 1,370-1,373.) (Abstract available.)
311	671	U.S.S.R. ...	*Properties of Synthetic Lubricating Oils (from the U.S.S.R.).* (E. Neyman-Pilat and S. Pilat, Ind. and Eng. Chem. (Ind. Ed.), Vol. 33, No. 11, Nov., 1941, pp. 1,382-1,390.)
312	678	U.S.A. ...	*Fuel Injection Tests with the Oscillograph.* (P. A. Schweitzer, Autom. Ind., Vol. 86, No. 1, 1/1/42, pp. 26-30.)
313	680	U.S.A. ...	*High Octane Fuel Production in the U.S.A.* (Autom. Ind., Vol. 86, No. 1, 1/1/42, p. 60.)
314	695	Great Britain	*The Use of Substitute Motor Fuels on the Continent.* (W. Landsberg, Engineering, Vol. 153, No. 3,969, 6/2/42, pp. 114-115.)
315	767	Great Britain	*Film Lubrication Problems.* (*Christopherson, J. Inst. Mech. Engrs., Jan.,* 1942, *pp.* 126-135.) (Met. Vick. Tech. News Bull., No. 798, 23/1/42, p. 8.) (Abstract available.)
316	889	U.S.A. ...	*Aircraft Fuel Systems.* (F. W. Heckert, S.A.E.J., Vol. 50, No. 1, Jan., 1942, p. 23.) (Abstract available.)
317	892	U.S.A. ...	*The Ignition Systems as Influenced by Fuel Characteristics.* (J. T. Fitzsimmons, S.A.E.J., Vol. 50, No. 1, Jan., 1942, pp. 15-19.) (Abstract available.)
318	894	U.S.A. ...	*Lubrication of Cold Engines.* (R. W. Young, S.A.E.J., Vol. 50, No. 1, Jan., 1942, pp. 41-42.) (Abstract available.)
319	971	Great Britain	*Oil Dilution for Cold Starting.* (T. W. Siers, Aeronautics, Vol. 6, No. 1, Feb., 1942, pp. 41-42.)
320	979	Great Britain	*Producer Gas for Road Transport, by B. Reed. (The Railway Gazette,* 1941, 6/-.) *(Review.)* (Engineer, Vol. 173, No. 4,493, 20/2/42, p. 161.)

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ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
321	476	Great Britain	*Torsion in Box Beams.* (J. H. Payne, Airc. Eng., Vol. 14, No. 155, Jan., 1942, pp. 2-8.)
322	478	Great Britain	*Automatic Riveting.* (*R.T.P. Translation No.* 1,339.) (A. V. Zeerleder, Airc. Eng., Vol. 14, No. 155, Jan., 1942, pp. 23-24.)

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323	480	U.S.A. ...	*Designing for Machinability (from the U.S.A.).* (J. E. Thompson, Airc. Eng., Vol. 14, No. 155, Jan., 1942, pp. 25-28.)
324	484	Great Britain	*Al. and Mg. in Aircraft Construction (Foundry and Casting Practice). (Bulletin du Service Technique, France, B.S.T., No.* 92.) (R. de Fleury, Airc. Eng., Vol. 14, No. 155, Jan., 1942, p. 22.)
325	493	Great Britain	*Rubber in the Automobile Industries—Recent Researches.* (Autom. Eng., Vol. 32, No. 419, Jan., 1942, pp. 15-18.)
326	497	Great Britain	*Chrome Recovery.* (Autom. Eng., Vol. 32, No. 419, Jan., 1942, pp. 35-37.)
327	508	Germany ...	*The Utilisation of Cladded Sheets in Ship Construction.* (W. Radeker, W.R.H., Vol. 22, No. 21, 1/11/41, pp. 320-323.)
328	509	Great Britain	*The Development of Nylon.* (E. K. Bolton, Chem. and Ind., Vol. 61, No. 3, 17/1/42, pp. 31-35.)
329	510	Germany ...	*Effect of Temperature on the Ageing of Al. Mg. Si. Alloys (Characteristic Difference Between Low Temperature and High Temperature).* (C. Haase and H. Wurst, Z. Metallk., Vol. 33, No. 12, Dec., 1941, pp. 399-403.)
330	512	Germany ...	*Hydronalium Castings for Ships.* (H. Kalpers, W.R.H., Vol. 22, No. 20, 15/10/41, pp. 304-305.)
331	519	U.S.A. ...	*Powder Metallurgy.* (F. C. Kelley, Autom. Ind., Vol. 85, No. 12, 15/12/41, pp. 34, 56-60.)
332	520	U.S.A. ...	*Application of Powder Metallurgy to the Mass Fabrication of Automobile Parts.* (H. Chase, Autom. Ind., Vol. 85, No. 12, 15/12/41, pp. 35 and 60.)
333	522	U.S.A. ...	*Heat Treated Spring Steel for Aircraft Armour.* (Autom. Ind., Vol. 85, No. 12, 15/12/41, p. 39.)
334	527	Great Britain	*Initial Stress and Elastic Instability (Elastic Constants for Small Strains Only Need be Considered).* (H. Jeffreys, Proc. Camb. Phil. Soc., Vol. 38, Pt. 1, Jan., 1942, pp. 125-128.)
335	529	Great Britain	*Crystallisation in an Inflated Rubber Balloon.* (A. Schallamach, Nature, Vol. 149, No. 3,769, 24/1/42, p. 112.)
336	530	Great Britain	*Longitudinal Ridged Structure in the Tin Coating of Tin Plate.* (B. Chalmers and W. E. Hoare, Engineering, Vol. 153, No. 3,967, 23/1/42, pp. 79-80.)
337	531	Great Britain	*The Jointing of Metals by Fusion.* (A. E. Richards, Metal Industry, Vol. 59, No. 22, 28/11/41, pp. 340-343.)
338	532	Great Britain	*Statistics in Metallurgy.* (Metal Industry, Vol. 59, No. 22, 28/11/41, p. 345.)
339	533	Great Britain	*Heavy Alloy (Wo.-Ni.-Cu.).* (G. H. S. Price and others, Metal Industry, Vol. 59, No. 23, 5/12/41, pp. 354-358.)
340	534	Great Britain	*The Jointing of Metals by Fusion.* (A. E. Richards, Metal Industry, Vol. 59, No. 23, 5/12/41, pp. 361-362.)

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341	543	Great Britain	*Causes of Porosity in Tin Bronze Castings.* (T. F. Pearson and W. A. Baker, Engineering, Vol. 153, No. 3,968, 30/1/42, pp. 95-96.)
342	544	Great Britain	*Portable Spot Welding Machine.* (Engineering, Vol. 153, No. 3,968, 30/1/42, p. 96.)
343	548	Germany ...	*Fabrication and Surface Protection of Light Alloys in Aircraft Construction—VI—Industrial Furnaces.* (R. Hamacher, Der Flieger, Vol. 20, No. 11, Nov., 1941, pp. 362-363.)
344	554	Great Britain	*Mechanical Tests of Cellulose Acetate.* (W. N. Findley, British Plastics, Vol. 13, No. 151, Dec., 1941, pp. 205-210.)
345	555	U.S.A. ...	*Designations for Heat and Corrosion Resistant Alloys adapted by the Alloy Casting Institute, U.S.A.* (Metal Progress, Vol. 40, No. 6, Dec., 1941, p. 904.)
346	556	U.S.A. ...	*New Details for Evaluating Mn.-Mo. Steels.* (R. M. Parke and others, Metal Progress, Vol. 40, No. 6, Dec., 1941, pp. 906-910.)
347	557	U.S.A. ...	*Standardisation of Hardenability Tests.* (W. E. Jominy, Metal Progress, Vol. 40, No. 6, Dec., 1941, pp. 911-914.)
348	600	Germany ...	*Wound Plastics Bearings.* (Inter. Avia., No. 792, 28/11/41, p. 16.) (Abstract available.)
349	641	U.S.A. ...	*Procedure Control of Aircraft Welding.* (A. R. Seemann, Aviation, Vol. 40, No. 11, Nov., 1941, pp. 66-67 and 144.)
350	650	U.S.A. ...	*Explosive Rivets.* (Aviation, Vol. 40, No. 11, Nov., 1941, p. 125.)
351	651	U.S.A. ...	*New Fabric Attachment Method (Bell Aircraft).* (Aviation, Vol. 40, No. 11, Nov., 1941, p. 125.)
352	653	U.S.A. ...	*Plated Aluminium in the Aircraft Industry.* (R. F. Yates, Aviation, Vol. 40, No. 11, Nov., 1941, pp. 84 and 146.)
353	655	U.S.A. ...	*Rapid Determination of the Specific Gravity of Plastic Materials.* (H. F. Palmer and W. E. Jones, Ind. and Eng. Chem. (Anal. Ed.), Vol. 13, No. 12, 15/12/41, pp. 864-867.)
354	657	U.S.A. ...	*Water Absorption of Resins.* (E. P. Irany, Ind. and Eng. Chem. (Ind. Ed.), Vol. 33, No. 12, Dec., 1941, pp. 1,551-1,554.)
355	661	U.S.A. ...	*Proximate Analysis of the Heartwood and Sapwood of Some American Hardwoods.* (R. D. Freeman and F. C. Peterson, Ind. and Eng. Chem. (Anal. Ed.), Vol. 13, No. 11, 15/11/41, pp. 803-805.)
356	663	Great Britain	*Metal Spraying—The British Wire Process.* (G. C. Pitcairn, Metal Industry, Vol. 60, No. 4, 23/1/42, pp. 50-51.)
357	664	Great Britain	*Flow of Metal in Brazing Aluminium.* (M. A. Miller, Metal Industry, Vol. 60, No. 4, 23/1/42, pp. 54-55.)
358	665	U.S.A. ...	*Present Status of Crude Rubber in the U.S.A.* (E. G. Holt, Ind. and Eng. Chem. (Ind. Ed.), Vol. 33, No. 11, Nov., 1941, pp. 1,339-1,341.)

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360	667	U.S.A. ...	*Present Status of Rubber Chemicals and Reclaimed Rubber in the U.S.A.* (J. P. Coe, Ind. and Eng. Chem. (Ind. Ed.), Vol. 33, No. 11, Nov., 1941, pp. 1,347-1,351.)
361	670	U.S.A. ...	*Working Range Flow Properties of Thermoplastics.* (F. E. Wiley, Ind. and Eng. Chem. (Ind. Ed.), Vol. 33, No. 11, Nov., 1941, pp. 1,377-1,380.) (Abstract available.)
362	674	Great Britain	*Survey of Spot Welding Plant—V.* (*Mech. World*, 28/11/41, *pp.* 388-390.) (Met. Vick. Tech. News Bull., No. 792, 12/12/41, p. 8.)
363	675	Great Britain	*Economic Possibilities of the Heat Pump.* (*P. E. Wirth, A.S.E. Bulletin*, 12/9/41, *pp.* 435-438.) (Met. Vick. Tech. News Bull. No. 792, 12/12/41, p. 9.)
364	677	U.S.A. ...	*Brazing Carbide Tips on Tools.* (Autom. Ind., Vol. 86, No. 1, 1/1/42, pp. 25 and 80.)
365	681	Great Britain	*Electric Furnaces for Non-Ferrous Heat Treatment.* (J. E. Oram, Metal Industry, Vol. 60, No. 6, 16/2/42, pp. 108-111.)
366	682	Great Britain	*Powder Metallurgy.* (H. W. Greenwood, Metal Industry, Vol. 60, No. 6, 16/2/42, pp. 112-114.)
367	683	Great Britain	*Polarographic Analysis* (*Dripping Mercury Electrode*). (Metal Industry, Vol. 60, No. 6, 16/2/42, p. 115.)
368	684	Great Britain	*Hard Metal Alloys* (*Contd.*). (G. A. Meerson and others, Metal Industry, Vol. 59, No. 20, 14/11/41, pp. 306-308.)
369	685	Great Britain	*Some Recent Developments in Bimetals* (*Contd.*). (Metal Industry, Vol. 59, No. 20, 14/11/41, p. 308.)
370	686	Great Britain	*The Welding of Light Alloys* (*II*). (E. G. West, Metal Industry, Vol. 59, No. 20, 14/11/41, pp. 312-313.)
371	687	Great Britain	*The Forging of Light Alloys* (*Discussion*). (Metal Industry, Vol. 59, No. 16, 17/10/41, pp. 242-244.)
372	688	Great Britain	*Deep Drawing and Pressing of Al. and Light Alloy Sheet. Part V, The German Process.* (Metal Industry, Vol. 59, No. 16, 17/10/41, pp. 245-247.)
373	689	Great Britain	*Deep Drawing and Pressing of Al. and Light Alloy Sheet. VII, Soft Metal Tools for Aircraft Pressings.* (J. D. Jervis, Metal Industry, Vol. 59, No. 18, 31/10/41, pp. 278-280.)
374	690	Great Britain	*Welding for the Repair of Steel Framed Structure.* (Engineer, Vol. 173, No. 4,491, 6/2/42, pp. 116-118.)
375	694	Great Britain	*The Breaking Strength of Glass.* (Engineering, Vol. 153, No. 3,969, 6/2/42, p. 112.)
376	697	Great Britain	*Surface Hardness of Metals.* (B. Chalmers, Engineering, Vol. 153, No. 3,969, 6/2/42, pp. 117-120.)

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377	700	U.S.A. ...	*Stainless Steel Movable Control Surfaces.* (G. G. Cudhea, J. Aeron. Sci., Vol. 9, No. 2, Dec., 1941, pp. 44-55.) (Abstract available.)
378	703	Great Britain	*Hard Metal (Tungsten and Titanium, Carbide-Cobalt Mixtures).* (G. A. Meerson and Y. M. Lipkes, Metal Industry, Vol. 59, No. 19, 7/11/41, pp. 290-293.)
379	704	Great Britain	*Some Recent Developments in Bimetals (Cladding and Plating).* (Metal Industry, Vol. 59, No. 19, 7/11/41, p. 293.)
380	705	Great Britain	*The Welding of Light Alloys.* (E. G. West, Metal Industry, Vol. 59, No. 19, 7/11/41, pp. 294-296.)
381	706	Great Britain	*Non-Destruction Testing of Light Metal Alloys.* (Metal Industry, Vol. 59, No. 19, 7/11/41, p. 296.)
382	707	Great Britain	*Beryllium Copper Alloys.* (Metal Industry, Vol. 59, No. 19, 7/11/41, p. 296.)
383	745	U.S.A. ...	*Strengthening Al. for Aircraft Structures (from the U.S.A.).* (R. R. Jackmann, Metal Industry, Vol. 59, No. 11, 12/9/41, pp. 162-164.)
384	746	Great Britain	*Deep Drawing and Pressing of Al. and Light Alloy Sheet, Part II (Precipitation Hardening Al. Alloys).* (J. D. Jevons, Metal Industry, Vol. 59, No. 11, 12/9/41, pp. 165-169.)
385	747	Great Britain	*Preferred Orientation in Copper Strip.* (Metal Industry, Vol. 59, No. 11, 12/9/41, p. 169.)
386	748	Great Britain	*Deep Drawing and Pressing of Al. and Light Alloy Sheet, Pt. II (Contd.) (Precipitation Hardening Al. Alloys).* (J. D. Jevons, Metal Industry, Vol. 59, No. 12, 19/9/41, pp. 178-180.)
387	749	Great Britain	*Applied Methods of Metal Degreasing.* (H. A. H. Crowther, Metal Industry, Vol. 59, No. 12, 19/9/41, pp. 181-183.)
388	750	Great Britain	*Strengthening Al. for Aircraft Structures (Concluded).* (Metal Industry, Vol. 59, No. 12, 19/9/41, p. 183.)
389	751	Great Britain	*Methods of Joining Monel, Nickel and Inconel.* (Metal Industry, Vol. 59, No. 12, 19/9/41, p. 184.)
390	753	Great Britain	*Relaxation Methods in Engineering Sciences. (R. V. Southwell, Oxford Engineering Sciences Series.* 17/6.) (*Book Review.*) (Nature, Vol. 149, No. 3,770, 31/1/42, pp. 123-124.)
391	761	Great Britain	*Modern Bearing Technique. (Hollies, Engineering and Boiler House Review, Jan.,* 1942, *pp.* 216-220.) (Met. Vick. Tech. News Bull., No. 799, 30/1/42, p. 1.) (Abstract available.)
392	762	Great Britain	*A.C. Arc Welding. (Potter, Welding Engineer, Dec.,* 1941, *pp.* 30-32.) (Met. Vick. Tech. News Bull., No. 799, 30/1/42, p. 2.) (Abstract available.)
393	765	Great Britain	*Oxy-Acetylene Flame Hardening, VIII. (Magrath, Machinist,* 10/1/42, *pp.* 958-960.) (Met. Vick. Tech. News Bull., No. 798, 23/1/42, p. 1.) (Abstract available.)
394	770	U.S.A. ...	*High Temperature Furnace for Ceramic Spark Plug Insulators.* (J. Frank. Inst., Vol. 233, No. 1, Jan., 1942, pp. 77-78.)

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
395	774	Great Britain	*The Hardening of Steel and the Electron Microscope.* (Metal Industry, Vol. 60, No. 7, 13/2/42, p. 129.)
396	775	Great Britain	*History of Die Casting.* (A. Street, Metal Industry, Vol. 60, No. 7, 13/2/42, pp. 130-132.)
397	778	Great Britain	*Laminated Plastics.* (Machinery, Vol. 60, No. 1,528, 22/1/42, pp. 14-16.)
398	782	Great Britain	*Heat Treatment of Molybdenum High Speed Steels.* (Machinery, Vol. 60, No. 1,530, 5/2/42, pp. 57-60.)
399	786	Great Britain	*The Future of Plastics in Aircraft.* (Plastics, Vol. 5, No. 57, Feb., 1942, pp. 1-2.)
400	787	Great Britain	*Synthetic Rubber.* (Plastics, Vol. 5, No. 57, Feb., 1942, pp. 3-4.)
401	788	Great Britain	*Plastic Sheet for Wrapping.* (E. E. Halls, Plastics, Vol. 5, No. 57, Feb., 1942, pp. 9-13.)
402	790	Great Britain	*The History of Wire-Drawing.* (F. C. Thompson, Metal Industry, Vol. 60, No. 5, 30/1/42, pp. 70-72.)
403	791	Great Britain	*Powder Metallurgy.* (H. W. Greenwood, Metal Industry, Vol. 60, No. 5, 30/1/42, pp. 77-79.)
404	792	Great Britain	*Progress in the Rolling of Non-Ferrous Metals.* (C. E. Davies, Metal Industry, Vol. 60, No. 5, 30/1/42, pp. 87-89.)
405	793	Great Britain	*Electric Furnaces for Non-Ferrous Heat Treatment.* (J. E. Oram, Metal Industry, Vol. 60, No. 5, 30/1/42, pp. 94-96.)
406	802	Great Britain	*Electrical Brazing Machine for Carbide-Tipped Tools.* (Engineering, Vol. 153, No. 3,970, 13/2/42, p. 126.)
407	806	Great Britain	*Probability Applications in Engineering.* (U. R. Evans, Engineer, Vol. 173, No. 4,492, 13/2/42, p. 143.)
408	810	U.S.A. ...	*Procedure Control for Aircraft Welding (II).* (A. K. Seemann, Aviation, Vol. 40, No. 12, Dec., 1941, pp. 116-117 and 210.)
409	850	U.S.A. ...	*Evaluation Methods for Defective Driven Rivets.* (F. D. Klein, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 154-162 and 214.)
410	852	U.S.A. ...	*Certification of Army and Navy Welders.* (W. R. Allen, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 164-166.)
411	860	U.S.A. ...	*Rivnut—A New Type of Blind Rivet (Used on Goodrich De-icers).* (R. H. Gill, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 232-235.)
412	870	U.S.A. ...	*Portable Arc Welder for Thin Gauge and Aircraft Welding (G.E.C.).* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 252.)
413	871	U.S.A. ...	*Synthetic Flexible Electric Conduit.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 255.)
414	873	U.S.A. ...	*Electrodes for Spot Welding Aluminium.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 260.)
415	880	Great Britain	*Machinability.* (D. Taylor, Autom. Eng., Vol. 32, No. 420, Feb., 1942, pp. 51-56.)

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
416	882	Great Britain	*Composite Bearing Shells (Pat. No.* 536,414). (General Motors, Autom. Eng., Vol. 32, No. 420, Feb., 1942, p. 80.)
417	887	U.S.A. ...	*Hardenability of Steels (S.A.E. Procedure).* (S.A.E.J., Vol. 50, No. 1, Jan., 1942, pp. 15-20.)
418	893	U.S.A. ...	*Roller Bearings.* (T. V. Buckwalter, S.A.E.J., Vol. 50, No. 1, Jan., 1942, pp. 20-36.) (Abstract available.)
419	897	Great Britain	*Mercury Boiler-Inhibiting Solution of Iron.* (Electrical Times, Vol. 101, No. 2,623, 29/1/42, p. 519.)
420	937	Germany ...	*Crack Detection by the Magnetic Powder Method.* (H. Schrader, E.T.Z., Vol. 62, No. 19, 8/5/41. pp. 447-448.)
421	938	Germany ...	*Standardisation of Magnet Steels.* (W. Zimbusch, E.T.Z., Vol. 62, No. 19, 8/5/41, p. 448.)
422	941	Germany ...	*Welding of Light Alloys by the Arc Atom Process* (E. Thiemer, E.T.Z., Vol. 62, No. 21, 22/5/41, p. 487.)
423	942	Germany ...	*Sag and Tension of Electric Cables Involving Differences in Level of Points of Suspension.* (P. Wittsack, E.T.Z., Vol. 62, No. 23, 5/6/41, pp. 520-522.)
424	944	Germany ...	*Substitute Materials for Bearings of Engines and Electric Motors.* (C. Brennecke, E.T.Z., Vol. 62, No. 23, 5/6/41, p. 530.)
425	950	Great Britain	*Application of Ignitrons to Resistance Welding Control.* (Bivens, A.I.E.E. Trans., Supplement to Electrical Engineering, June, 1941, pp. 471-478.) (Abstracted in Met. Vick. News Bulletin, No. 800, p. 4.)
426	952	Great Britain	*Oxy-Acetylene Flame Hardening, IX. (Magrath, Machinist,* 24/1/42, *pp.* 1,036-1,038.) (Abstracted in Met. Vick. Tech. News Bull., No. 800, p. 8.)
427	953	Great Britain	*Metrovick Portable Spot Welding Appliance.* (Mech. World, 23/1/42, p. 83.) (Abstracted in Met. Vick. Tech. News Bull., No. 800, p. 8.)
428	954	Great Britain	*Non-Destructive Testing.* (Autom. Eng., Dec., 1941, pp. 448-450.) (Met. Vick. Tech. News Bull., No. 800, 6/2/42, p. 11.) (Abstract available.)
429	978	Great Britain	*Grain Size Control in Steel.* (H. O'Neill, Engineer, Vol. 173, No. 4,493, 20/2/42, pp. 158-159.)
430	985	Germany ...	*European Co-operation on the Question of Replacement Materials.* (Z.V.D.I., Vol. 85, No. 43-44, 1/11/41, p. 858.)

INSTRUMENTS.

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
431	468	France ...	*Integrating Altimeter.* (F. Charron, Comptes Rendus, Vol. 212, No. 20, 19/4/41, pp. 852-854.) (Abstract available.)
432	469	France ...	*The Measurement of Interfacial Surface Tension by the Immersed Plate Method.* (A. Dognon, Comptes Rendus, Vol. 212, No. 20, 19/4/41, pp. 854-855.) (Abstract available.)

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
433	494	Great Britain	*Optics in Engineering (Projectors, Magnifiers, etc.).* (M. H. Taylor, Autom. Eng., Vol. 32, No. 419, Jan., 1942, pp. 19-22.)
434	505	Great Britain	*Viewing Device for Increasing Perspective Vision of Moving Objects.* (Flight, Vol. 41, No. 1,726, 22/1/42, p. f.)
435	537	Great Britain	*High Speed Action Analysis.* (*Watson, General Electric Review, Oct.*, 1941, *pp.* 549-557.) (Met. Vick. Tech. News Bull., No. 797, 16/1/42, p. 12.) (Abstract available.)
436	538	Great Britain	*The Cartographic Solution of Great Circle Problems.* (A. J. Dilloway, J.R. Aeron. Soc., Vol. 46, No. 373, Jan., 1942, pp. 4-31.)
437	542	Great Britain	*Signal Lamps for Night Surveying.* (Engineering, Vol. 153, No. 3,968, 30/1/42, p. 86.)
438	624	Switzerland	*Precision Pressure Gauges for Aerodynamic Tests on Models.* (R. Tanner, Turbo Machinery, Escher Wyss Res. Pub., 1939, pp. 43-46.)
439	646	U.S.A.	*Non-Magnetic Instrument Plant (Kollsmann).* (Aviation, Vol. 40, No. 11, Nov., 1941, p. 89.)
440	652	U.S.A.	*Gardner Flight Calculator Wrist Watch.* (Aviation, Vol. 40, No. 11, Nov., 1941, p. 133.)
441	660	U.S.A.	*Photometry in Spectrochemical Analysis.* (W. C. Pierce and N. H. Nachtrieb, Ind. and Eng. Chem. (Anal. Ed.), Vol. 13, No. 11, 15/11/41, pp. 774-781.)
442	698	U.S.A.	*Bibliography of Flight Instruments (Gyroscopes, Radio Direction Finders, General).* (J. Aeron. Sci., Vol. 9, No. 2, Dec., 1941, pp. 51-59 and 61.)
443	729	U.S.A.	*Instrument Flight Training for Commercial Air Pilots.* (H. Davis, Instruments, Vol. 14, No. 10, Oct., 1941, p. 290, 313-314.)
444	730	U.S.A.	*A General Consideration of Aircraft Instruments.* (A. Klemin, Instruments, Vol. 14, No. 10, Oct., 1941, pp. 274 and 311.)
445	731	U.S.A.	*Anti-Vibration Mounting of Aeroplane Instruments.* (S. J. Zand and L. N. Swisher, Instruments, Vol. 14, No. 10, Oct., 1941, pp. 294-296.)
446	732	U.S.A.	*Instrument Instruction at M.I.T.* (C. S. Draper, Instruments, Vol. 14, No. 10, Oct., 1941, p. 278.)
447	733	U.S.A.	*Hydraulic System Test Instrumentation.* (W. J. Rath, Instruments, Vol. 14, No. 10, Oct., 1941, p. 292.)
448	734	U.S.A.	*Calibrating Vibration Measuring Instruments Over a 30/1 Frequency Range.* (J. M. Whitmore, Instruments, Vol. 14, No. 10, Oct., 1941, pp. 280-281, 312-313.)
449	735	U.S.A.	*Aircraft Thermocouples.* (R. D. Kelly, Instruments, Vol. 14, No. 10, Oct., 1941, pp. 298-300 and 308.)
450	736	U.S.A.	*Sperry Dual Automatic Direction Finder.* (R. C. Shrader, Instruments, Vol. 14, No. 10, Oct., 1941, pp. 282 and 308.)

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
451	737	U.S.A.	*Test Flight Data Automatically Filmed.* (G. W. Lescher, Instruments, Vol. 14, No. 10, Oct., 1941, p. 301.)
452	738	U.S.A.	*An Electro-Magnetic Balance for Wind Tunnel Measurement.* (T. S. Eastmann, Instruments, Vol. 14, No. 10, Oct., 1941, pp. 284-285 and 310-311.)
453	739	U.S.A.	*Notes on Some Engine Instrument Tests.* (M. Eggleston, Instruments, Vol. 14, No. 10, Oct., 1941, pp. 288-289.)
454	740	U.S.A.	*Calibrating Tachometers with the Oscilloscope.* (E. M. Glaser, Instruments, Vol. 14, No. 10, Oct., 1941, pp. 302-306.)
455	741	U.S.A.	*Flight Data Recorders (Altitude, Airspeed, Acceleration, etc.).* (Instruments, Vol. 14, No. 10, Oct., 1941, p. 318.)
456	743	U.S.A.	*Cambridge Exhaust Gas Analyser (Thermal Conductivity Method).* (Instruments, Vol. 14, No. 10, Oct., 1941, p. 320.)
457	744	U.S.A.	*Electronic Micrometer for Testing Diaphragms for Instruments.* (Instruments, Vol. 14, No. 10, Oct., 1941, p. 321.)
458	752	Great Britain	*X-Ray Analysis in Industry.* (Metal Industry, Vol. 59, No. 12, 19/9/41, p. 188.)
459	755	Great Britain	*Use of Camera Lucida for Transcribing Diagrams.* (B. Dawes, Nature, Vol. 149, No. 3,770, 31/1/42, p. 140.)
460	766	Great Britain	*Measurement of Gases.* (*T. Baker, El. Rev.*, 9/1/42, *pp.* 41-42.) (Met. Vick. Tech. News Bull., No. 798, 23/1/42, p. 5.) (Abstract available.)
461	781	Great Britain	*Gears for Clockwork Mechanism (Standardisation).* (J. Scientific Instruments, Vol. 19, No. 1, Jan., 1942, p. 15.)
462	785	Great Britain	*Visual Examination of High Speed Phenomena (Review of Available Methods).* (Electrician, Vol. 128, No. 3,323, 6/2/42, pp. 95-97.)
463	789	Great Britain	*Temperature Indicating Paints.* (Electrical Times, Vol. 101, No. 2,622, 22/1/42, p. 484.)
464	799	Germany	*Method of Determining Centrifugal Moments with the Moment of Inertia Planimeter.* (E. R. Meyer, Z. Instrum., Vol. 61, No. 11, Nov., 1941, pp. 381-384.)
465	801	Germany	*Calculating Machines.* (F. A. Willers, Z. Instrum., Vol. 61, No. 11, Nov., 1941, p. 388.)
466	821	U.S.A.	*Douglas "Cold Room" Laboratory.* (Aviation, Vol. 40, No. 12, Dec., 1941, p. 155.)
467	822	U.S.A.	*The Transmissometer (Measured Value for Visibility Range).* (Aviation, Vol. 40, No. 12, Dec., 1941, p. 155.)
468	858	U.S.A.	*Navigation Flight Training.* (W. C. Youngclaus, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 66/69, 227.)

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
469	875	U.S.A.	*Wind Drift Simulator for Link Trainer.* (Aero Digest, Vol. 39, No. 6, Dec., 1941, p. 267.)
470	943	Germany	*Measurement of Low Gas Pressure by Means of Thermo-Electric Devices.* (Moll and Barger, E.T.Z., Vol. 62, No. 23, 5/6/41, p. 528.)
471	947	Switzerland	*Apparatus for Testing Stereoscopic Eye Sight (Selection of Personnel for Stereoscopic Range Finders).* (H. Donatsch, Flugwehr und Technik, Vol. 4, No. 1, Jan., 1942, pp. 12-17.)
472	951	Great Britain	*An Electrical Engine Indicator for Measuring Static and Dynamic Pressures.* (Martin and others, A.I.E.E. Trans., Supplt. to Electrical Engineering, June, 1941, pp. 513-523.) (Abstracted in Met. Vick News Bull. No. 800, p. 7.)
473	970	Great Britain	*Aircraft Instruments.* (*G. Ellis, McGraw Hill,* 35/-.) (*Review.*) (Aeronautics, Vol. 6, No. 1, Feb., 1942, p. 29.)
474	980	Great Britain	*Some Developments in Electrical and Optical Instruments.* (Engineer, Vol. 173, No. 4,493, 20/2/42, pp. 167-168.)

PHOTOGRAPHY.

475	769	U.S.A.	*Direct Process for Making Photographic Prints in Colour.* (C. E. K. Mees, J. Frank. Inst., Vol. 233, No. 1, Jan., 1942, pp. 41-50.)
476	797	Germany	*The Theory of Pancrastic Lens Systems (Continuous Variation in Magnification Possible).* (G. Karff, Z. Instrum., Vol. 61, No. 10, Oct., 1941, pp. 321-337.)
477	800	Germany	*Increasing Exposure Time during Photographic Night Reconnaissance by Mechanical Control of Optic Axis.* (M. Nagel, Z. Instrum., Vol. 61, No. 11, Nov., 1941, p. 387.)
478	877	France	*The Determination of Exposure Time in Aerial Photography.* (A. Charrion and S. Rocker-Valette, Publ. Scient. Techn. du Secretarial d'Etat a l'Aviation, B.S.T., No. 94, 1941.) (Abstract available.)
479	930	U.S.A.	*Photography.* (R. S. Quackenbush, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 147-149, 248-250.)

WIRELESS AND ELECTRICITY.

480	536	Great Britain	*Electronic Microscope Developments.* (*Hillier and Vance, Procs. I.R.E., April,* 1941, *pp.* 167-176.) (Met. Vick. Tech. News Bull., No. 797, 16/1/42, p. 10.) (Abstract available.)
481	605	Germany	*Cable Conduit (Electrical).* (Flugsport, Vol. 34, No. 1, 7/1/42, pp. 6-7.)

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
482	615	Germany	*End Cone for Towing Ropes Incorporating Telephone Cables. (Pat. No.* 713,058.) (Siemens, Flugsport, Vol. 34, No. 1 (Pat. Coll. No. 20), 7/1/42, p. 84.)
483	643	U.S.A.	*Position Fixes by D./F. Bearings.* (C. H. McIntosh, Aviation, Vol. 40, No. 11, Nov., 1941, pp. 72-73, 162-168.)
484	658	U.S.A.	*Corona Discharge on Liquid Di-electrics.* (J. Sticher and J. D. Piper, Ind. and Eng. Chem. (Ind. Ed.), Vol. 33, No. 12, Dec., 1941, pp. 1,567-1,574.)
485	696	Great Britain	*Fluorescent Lighting.* (Engineering, Vol. 153, No. 3,969, 6/2/42, p. 116.)
486	728	U.S.A.	*C.A.A. and Industry Co-operate to Develop Instrumentation (Direction Finder, U.H.F. Instrument Landing System).* (C. L. Stanton, Instruments, Vol. 14, No. 10, Oct., 1941, pp. 272-273.)
487	756	Great Britain	*Wireless Engineer Abstracts and References.* (Compiled by the Radio Research Board, Feb., 1942.)
488	764	Great Britain	*Aircraft Precipitation—Static Radio Interference. (Starr, A.I.E.E. Transactions, Suppl. to Electrical Engineering, June,* 1941, *pp.* 363-370.) (Met. Vick. Tech. News Bull., No. 799, 30/1/42, p. 7.) (Abstract available.)
489	780	U.S.A.	*A Radio Frequency Device for Detecting the Passage of a Bullet (Velocity Determinations).* (C. I. Bradford, Procs. I.R.E., Vol. 29, No. 11, Nov., 1941, pp. 578-583.)
490	818	U.S.A.	*Azimuth Indicator for Ground Stations (Bell Lab.).* (Aviation, Vol. 40, No. 12, Dec., 1941, p. 124.)
491	855	U.S.A.	*Radio Range Ambiguities.* (D. S. Little, Aero Digest, Vol. 39, No. 6, Dec., 1941, pp. 62-65 and 222.)
492	895	Great Britain	*Short Wave Radio Valves.* (Electrical Review, Vol. 130, No. 3,348, 23/1/42, p. 115.)
493	933	U.S.A.	*Radio.* (C. B. H. Hall, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 157-159, 178.)
494	939	U.S.A.	*Piezo Electric Telephones.* (L. Sengewitz, E.T.Z., Vol. 62, No. 20, 15/5/41, pp. 463-465.)
495	940	Germany	*Compensated Electrical Temperature Recorders.* (W. Hunsinger, E.T.Z., Vol. 62, No. 21, 22/5/41, pp. 481-486.)

SOUND, LIGHT AND HEAT.

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
496	486	Great Britain	*Control of the Colour Temperature of Incandescent Signalling Lamps (B.S.T. No.* 92). (M. Roulleau, Airc. Eng., Vol. 14, No. 155, Jan., 1942, p. 22.)
497	535	Great Britain	*La Mont High Pressure Boiler. (Electrical Times,* 1/1/42, *pp.* 376-379.) (Met. Vick. Tech. News Bull., No. 797, 16/1/42, p. 6.)
498	672	U.S.A.	*Latent Heat of Vapourisation.* (H. P. Meissner, Ind. and Eng. Chem. (Ind. Ed.), Vol. 33, No. 11, Nov., 1941, pp. 1,440-1,443.)

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
499	699	U.S.A. ...	*Propagation of Sound Through the Atmosphere.* (B. Haurwitz, J. Aeron. Sci., Vol. 9, No. 2, Dec., 1941, pp. 35-43.) (Abstract available.)
500	886	Great Britain	*Heat Flow When Boundary Condition is Newton's Law.* (J. H. Awberry, Phil. Mag., Vol. 33, No. 217, Feb., 1942, pp. 157-158.)
501	936	Germany ...	*Polarised Light for Transport Vehicles.* (W. Rentschler, E.T.Z., Vol. 62, No. 19, 8/5/41, pp. 437-441.)

METEOROLOGY AND PHYSIOLOGY.

502	648	U.S.A. ...	*Photo-electric Measurement of Cloud Heights.* (Aviation, Vol. 40, No. 11, Nov., 1941, p. 96.)
503	725	Germany ...	*Measuring Pilot's Reaction Time by the Luftwaffe (Electric Wheel).* (Flight, Vol. 41, No. 1,728, 5/2/42, p. e.)
504	798	Germany ...	*New Measurements on Visual Thresholds.* (H. Siedentopf and others, Z. Instrum., Vol. 61, No. 11, Nov., 1941, pp. 372-380.)
505	827	Great Britain	*Physiological Effect of Rapid Acceleration.* (F. C. Sheffield, Flight, Vol. 41, No. 1,729, 12/2/42, pp. g-135.)
506	932	U.S.A. ...	*Aerology.* (H. T. Owille, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 154-156, 170, 178.)

MISCELLANEOUS.

507	472	Great Britain	*Bristol Aero Engine Dept. Technical Abstracts and Information.* (Vol. 6, No. 2, 14/1/42.)
508	473	Great Britain	*Bristol Aero Engine Dept. Technical Abstracts and Information.* (Vol. 6, No. 3, 21/1/42.)
509	474	Great Britain	*Rotol Digest.* (Vol. 3, No. 2, 14/1/42.)
510	475	Great Britain	*Rotol Digest.* (Vol. 3, No. 3, 21/1/42.)
512	513	Great Britain	*Rolls-Royce Technical Abstracts and Information.* (Vol. 111, No. 1, Jan., 1942.)
513	515	Great Britain	*Bristol Aero Engine Dept. Technical Abstracts and Information.* (Vol. 6, No. 4, 28/1/42.)
514	516	Great Britain	*Rotol Digest.* (Vol. 3, No. 4, 28/1/42.)
515	524	Great Britain	*The Dimensions of Physical Quantities.* (W. Wilson, Phil. Mag., Vol. 33, No. 216, Jan., 1942, pp. 26-33.)
516	757	Great Britain	*Rotol Digest.* (Vol. 3, No. 5, 4/2/42.)
517	758	Great Britain	*Rotol Digest.* (Vol. 3, No. 6, 11/2/42.)
518	759	Great Britain	*Bristol Aero Engine Dept. Technical Abstracts and Information.* (Vol. 6, No. 5, 4/2/42.)
519	760	Great Britain	*Bristol Aero Engine Dept. Technical Abstracts and Information.* (Vol. 6, No. 5, 11/2/42.)
520	784	Great Britain	*Discussion on Possibilities of an Electrical Basis of Water Divining.* (Electrician, Vol. 128, No. 3,323, 6/2/42, p. 94.)

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
521	825	Great Britain	*Rocket Flight to the Moon.* (R. A. Smith, Flight, Vol. 41, No. 1,729, 12/2/42, pp. d-f.)
522	929	U.S.A. ...	*Experiment and Research.* (L. C. Stevens, Flying and Popular Aviation, Vol. 30, No. 1, Jan., 1942, pp. 143-146, 224.)
523	986	Germany ...	*The Magno Water Softening Process.* (Z.V.D.I., Vol. 85, No. 43-44, 1/11/41, pp. 866.)