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3,8501b. By early last year, nearly 600 Yak-40s were in service.
^47-25 Three-stage fan, eight-stage h-p compressor, annular
combustor, single-stage h-p turbine, two-stage 1-p turbine. Take-
off 3,3001b; bypass ratio 2:1; pressure ratio 8-0:1; mass flow
lOOlb/sec; length 78-Sin; width 32-3in; height 35-2in; weight
6391b.

KAWASAKI HEAVY INDUSTRIES (Japan)
Engine Department, Kawasaki Heavy Industries Ltd. Head-quarters: 38 Akashi-machi, Ikuta-Jcu, Kobe. 'Tel: Kobe (07S) 341-7731.

Public company engaged in shipbuilding, rolling stock, general engineering aircraft and aero-engine manufacture. Corporate assets Y777,252 million, £1,114 million, and employees 38,921. Corporate sales in 1973 up to Y530,87S million, £761 million, of which aero-engine sales represented an extremely small per-centage.
KH I started licence-manufacture in 1973 of the 1,400 s.h.p. Lycoming T53-L-13 turboshaft for Bell/Fuji HU-1H helicopters, having previously built 1,100 s.h.p. T53-L-lls for Fuji/Bell HIT-IBs. The company is also participating in the Government-backed FJR710 turbofan development programme.

KLOCKNER-HUMBOLDT-DEUTZ (West Germany)
Gas Turbine Division, Klockner-Humboldt-Deutz AG. Divisional headquarters: Oberursel Works, Oberursel, Hohenmarkstrasse 60-70. Tel: (06171)5 10 41.
Public company with corporate activities covering the manu-facture of commercial vehicles, diesel engines, tractors, con-struction machinery, industrial plant, and aero-engines. Corpor-ate assets DM2,381 million, £417 million, and 43,991 employees. Corporate sales in 1972 up to DM2,966 million, £519 million, of which aero-engine activities accounted for approximately 5 per cent.

KHD, having licence-built Rolls-Royce Orpheus turbojets and Avco Lycoming T53 turboshafts, is currently engaged in overhaul and spare-parts manufacture for these engines. The Gas Turbine Division has also developed the small T112 APU for the VAK 191B in collaboration with Rolls-Royce, and has adapted this unit as the T212 air-compressor power unit for the Dornier Do32 Kiebitz drone and as the T312 APU for the MRGA. In addition KHD will be participating, to the extent of 22 per cent, in the forthcoming production programme for Turbomeca-Snecma Larzac 04 turbofans for the Franco-German Alpha Jet trainer. During 1974, the Gas Turbine Division was promoting its activi-ties under three headings: development ability, manufacturing facilities and service support.

KOLIESOV (USSR)
This new and little-known bureau is reported to be developing an advanced variable-cycle engine to replace the Kuznetsov NK144 turbofan powering the Tupolev Tu-144 and Backfire bomber.

KUZNETSOV(USSR)
This bureau has concentrated on high-performance engines, including the world's most powerful turboprop, the 14,795 e.h.p, NK-12M. In general its products have not proved outstandingly successful, and it is perhaps relevant to note that it was chief engineer N. D. Kuznetsov who headed the team of Russian engineers that visited Rolls-Royce (1971) towards the end of 1973 to discuss possible acquisition of R-R licences and/or technology.

NK-12 Single-shaft turboprop. This huge engine, driving eight-bladed contra-props, powers the Tupolev Tu-114 (4 X 14,795 e.h.p. NK-12MV), AntonovAn-22 (4 x 14,795 e.h.p. NK-12MA), and Tupolev Tu-95 (4 x 12,000 e.h.p. NK-12M).
NK-12MV Fourteen-stage compressor, annular combustor, five-stage turbine. Integral front-located gearbox. Take-off 14,795 e.h.p.; pressure ratio 13-0:1; mass flow 1431b/sec; length 236*2in; diameter 45-3in; weight 5,1801b.

NK-144 Augmented two-shaft turbofan. Power unit both of the Tupolev Tu-144 SST and Tupolev Backfire supersonic
s variable-geometry bomber, the NK-144 is designed for supersonic cruise with reheat in operation. Since first publicised in the Tu-144 the augmented take-off thrust has been raised from 38,5001b to 44,0001b. Entry into service of the Tu-144 with Aeroflot is ex-pected during this year.

NK-144 Two-stage fan and three-stage i-p compressor, eleven-stage h-p compressor, annular combustor, single-stage h-p turbine, two-stage 1-p turbine, afterburner and variable nozzle. Take-off 28,6601b, rising with reheat to 44,0001b; bypass ratio 1-0:1; pressure ratio 15:1; mass flow 550lb/sec; length 205in; diameter 59in; weight 6,2801b.

LOTAREV(USSR)
Vladimir A. Lotarev is "chief constructor" at the design bureau carrying the name of the late '"'general designer" Alexander G. Ivchenko. First engine to emerge under the authority of Lotarev is the D-36 commercial turbofan of 5-34:1 bypass ratio under development for the Yakovlev Yak-42 trijet. Under the Russian system, where the design function appears frequently to be separated from construction activity, the new engine with its D designation may well be of Soloviev origin. The 14,9101b D-36 has been under test since at least early 1973, and was scheduled to be test-flown under a modified Tupolev Tu-16 in February last year. The turbofan is the first Russian engine designed specifi-cally to meet FAA FAR Part 36 noise regulations. Weight is reported to be only 2,3801b. The Yak-42 is expected to fly next year or in 1977.
It is understood that the Lotarev and Soloviev bureaux are competing in the development of a big new civil turbofan in the 50,000lb-thrust class. This is to power the new Ilyushin 11-86 transport for introduction in the late 1970s. It is also reported that the USSR is seeking technical assistance from P&W, GE or R-R in bringing the turbofan through development and into production.

LUCAS AEROSPACE (United Kingdom)
Lucas Aerospace Headquarters: Shirley, Solihull, Warwickshire. Tel: 021-744 8522.
Subsidiary of Joseph Lucas (Industries) with corporate activities covering manufacture of equipment for automobiles, aerospace, shipping and railways. Corporate assets £353-6 million, $821 million, and employees 82,150. 1973—74 corporate turnover up to £452-8 million, $1,051 million, of which an increased £60-9 million, $141-5 million, was related to aerospace equipment sales. Lucas Aerospace, "with 14,000 employees and six major plants in Britain, and holdings in companies in Germany, France and Italy, is the largest company of its kind outside the USA, and the fourth largest aerospace company in the UK. The firm ac-quired the assets and goodwill of Rover Gas Turbines from British Leyland Motor Corporation in December 1972 for a reported figure of £400,000, $936,200, and has subsequently continued with the former activities of Rover in full. This operation, which was previously handled by Alvis British Leyland UK at Coventry, is being carried out by Lucas Aerospace Airframe Systems Division, being complementary to the Division's existing involvement in gas-turbine APUs and starters. The other main product group at Lucas Aerospace, the Engine Systems Division, manufactures a wide range of gas-turbine engine-management systems and equipment, including the fan thrust-reverser for the Rolls-Royce RB.211. If the anticipated 800 MRCAs are built, Lucas Aerospace stands to gain some £100 million, $232 million, from its equipment used on the RB.199 and airframe. Current efforts are directed at increasing the company's share of the international aerospace market by further acquisitions in Europe, and by expansion of facilities elsewhere in the world.

CT3201 Single-shaft turbojet. Originally designed by Rover Gas Turbines (under the designation TJ125), this small unit has been developed to power the MBLE Epervier battlefield recon-naissance drone. Since being taken over by Lucas, fuel system modifications have improved engine performance at altitude. Testing of the drone was completed by MBLE and the Belgian Army in June 1973, and the latter is expected to place an initial order for some 40 drones. With the definitive CT3201 rated at 1141b, there are projected derivatives of 601b and 1701b thrust. CT3201 Single-stage centrifugal compressor, annular reverse-flow combustor, single-stage radial-inflow turbine. Take-off 1141b; pressure ratio 3-9:1; mass flow 2-051b/sec; length 22in; width l0-6in; height 12-3in; weight 431b.

LYULKA (USSR)
This design bureau appears to specialise in military turbojets. Two of its current engines are the AL-5 and the AL-7, with ratings respectively of 10,1401b/ll,0231b and 14,3301b/15,4401b.