

AERO ENGINES 1970 . . .

JT9D-3W with water injection which was scheduled for delivery late in 1969; the 45,500lb JT9D-7 scheduled for certification mid-1971 and delivery January 1972; the water injection 47,000lb JT9D-7W; and the 49,800lb JT9D-17 under \$40 million to \$100 million (£16.7 million to £41.7 million) development for the DC-10-20 and planned for certification mid-1972. Further (undesigned) growth versions are projected at 51,000lb and 52,500lb. Anticipated flying time on JT9Ds by mid-1971 is one million hours, rising to six million hours by 1973. More than 12,000 JT9Ds are currently on order.

Applications Boeing 747, 4×JT9D-3 (43,500lb), Boeing 747-200, 4×JT9D-3W (45,000lb), and by 1972 4×JT9D-7 (45,500lb) or 4×JT9D-7W (47,000lb), Boeing 747C and F, 4×JT9D-7 (45,500lb) or 4×JT9D-7W (47,000lb), McDonnell Douglas DC-10-20, 3×JT9D-17 (49,800lb).

(JT9D-3) Single-stage fan plus three-stage l-p compressor (both driven by l-p turbine), eleven-stage h-p compressor (first four stages variable stators), annular combustor, two-stage h-p turbine, four-stage l-p turbine. Take-off 43,500lb; b.p.r. 5:1; mass flow 1,484lb/sec; pressure ratio 22:1; length 128.2in; diameter 95.6in; weight 8,430lb.

JT8D Civil two-shaft turbofan. Launched as a private-venture engine to power the Boeing 727, the JT8D has also been chosen to power a wide variety of other short- and medium-haul subsonic transports. It is also being developed under licence by Flymotor as RM8 supersonic augmented turbofan for the Saab Viggen fighter. Close on 5,000 JT8Ds have been delivered and production is now reducing. Latest version is 15,500lb JT8D-15 for optional use in future Boeing 737 short-field version.

Applications Boeing 727-100 and -100C, 3×JT8D-1 (14,000lb) or 3×JT8D-7 (14,000lb), Boeing 727 QC, 3×JT8D-7 (14,000lb), Boeing 727-200, 3×JT9D-7 (14,000lb) or 3×JT8D-9 (14,500lb), Boeing 737-100 and -200, 2×JT8D-7 (14,000lb) or 3×JT8D-9 (14,000lb), Boeing 737-200C, 2×JT8D-7 (14,000lb), Boeing 737 short-field, 2×JT8D-7 (14,000lb) or 2×JT8D-9 (14,500lb) or 2×JT8D-15 (15,500lb), Dassault Mercure, 2×JT8D-11 (15,000lb), McDonnell Douglas DC-9-10, 2×JT8D-1 (14,000lb) or 2×JT8D-5 (12,250lb) or 2×JT8D-7 (14,000lb), McDonnell Douglas DC-9-10F, 2×JT8D-1 (14,000lb), McDonnell Douglas DC-9-20, 2×JT8D-9 (14,500lb) or 2×JT8D-11 (15,000lb), McDonnell Douglas DC-9-30, 2×JT8D-7 (14,000lb) or 2×JT8D-9 (14,500lb) or 2×JT8D-11 (15,000lb), McDonnell Douglas DC-9-30F, 2×JT8D-7 (14,000lb), McDonnell Douglas DC-9-40, 2×JT8D-9 (14,500lb) or 2×JT8D-11 (15,000lb), McDonnell Douglas C-9A, 2×JT8D-9 (14,500lb), NAMC XC-1A, 2×JT8D-9 (14,500lb), Sud-Aviation Caravelle 10R, 2×JT8D-1 (14,000lb) or 2×JT8D-7 (14,000lb), Sud-Aviation Caravelle 11R and Super Caravelle, 2×JT8D-7 (14,000lb), Sud-Aviation Caravelle 12, 2×JT8D-9 (14,500lb).

(JT8D-11) Two-stage fan plus four-stage i-p compressor (both driven by l-p turbine), seven-stage h-p compressor, annular combustor with nine flame tubes, single-stage h-p turbine, three-stage l-p turbine. Take-off 15,000lb; b.p.r. 1.1:1; mass flow 316lb/sec; pressure ratio 17.5:1; length 120in; diameter 42.5in; weight 3,310lb.

JT3D Civil two-shaft turbofan. Front-fan derivative of J57/JT3C turbojet, was first American turbofan to enter commercial operation. More than 7,500 JT3Ds (including turbofan conversions of JT3C turbojets) have been delivered and production is now reducing.

Applications Boeing 707-120B, 4×JT3D-1 (17,000lb) or 4×JT3D-3 (18,000lb), Boeing 707-320B, 4×JT3D-3 or -3B (18,000lb), Boeing 707-320C, 4×JT3L-3B (18,000lb), Boeing VC-137B, 4×JT3D, Boeing 720B, 4×JT3D-1 (17,000lb) or 4×JT3D-3 (18,000lb), McDonnell Douglas DC-8-50, 4×JT3D-1 (17,000lb) or 4×JT3D-3 (18,000lb), McDonnell Douglas DC-8-55, 4×JT3D-3B (18,000lb), McDonnell Douglas DC-8-61 and -61F, 4×JT3D-3B (18,000lb), McDonnell Douglas DC-8-62, -63, -63F and -63CF, 4×JT3D-7 (18,000lb), McDonnell Douglas DC-9-50 project, 2×JT3D.

(JT3D-5A) Two-stage fan plus six-stage i-p compressor (both driven by l-p turbine), eight-stage h-p compressor, annular combustor with eight flame tubes, single-stage h-p turbine, three-stage l-p turbine. Take-off 21,000lb; pressure ratio 16:1; length 167.5in; diameter 53.0in; weight 4,540lb.

TF33 Military two-shaft turbofan. Military counterpart to JT3D and first American turbofan to enter military service.

Applications Boeing B-52H, 8×TF33-P-3 (17,000lb), Boeing C-135B, 4×TF33-P-5 (18,000lb), Boeing KC-135B, 4×TF33-P-9 (18,000lb), Lockheed C-141A StarLifter, 4×TF33-P-7 (21,000lb), Martin RB-57F, 2×TF33-P-11 (18,000lb).

(TF33-P-7) Two-stage fan plus seven-stage i-p compressor (both driven by l-p turbine), seven-stage h-p compressor, annular combustor with eight flame tubes, single-stage h-p turbine, three-stage

l-p turbine. Take-off 21,000lb; b.p.r. 1.25:1; mass flow 500lb/sec; pressure ratio 16:1; length 142.3in; diameter 53.0in; weight 4,605lb.

TF30 Military two-shaft augmented turbofan. Initially launched as JTF10A civil turbofan, now constitutes major combat engine programme in the United States. Powering the F-111, was the first supersonic augmented turbofan to enter service. Pratt & Whitney has offered higher rated 25,000lb TF30-P-100, about 5,000lb more thrust than production TF30s. Also collaborative development by Sncma under licence as TF306.

Applications General Dynamics F-111A, F-111C, F-111D, F-111E and RF-111A, 2×TF30-P-3 (20,000lb class with afterburning), General Dynamics FB-111A, 2×TF30-P-7, Grumman F-14A, 2×TF30-P-412 (21,500lb with afterburning), Ling-Temco-Vought A-7A Corsair II, 1×TF30-P-6 (11,350lb), Ling-Temco-Vought A-7B and A-7E, 1×TF30-P-8 (12,200lb).

(TF30) Three-stage fan plus six-stage i-p compressor (both driven by l-p turbine), seven-stage h-p compressor, annular combustor with eight flame tubes, single-stage h-p turbine, three-stage l-p turbine, close-coupled afterburner with variable convergent-divergent ejector nozzle. Take-off 20,000lb class with afterburning; diameter 42.1in; weight 2,715lb (TF30-P-6), and 2,526lb (TF30-P-8).

J60 Military single-shaft turbojet. Scaled-down counterpart to the J58 turbojet.

Applications Lockheed C-140A, 2×J60-P-5 (3,000lb), Martin RB-57F, 2×J60-P-9 booster units (3,300lb), North American T-39A, B & D, 2×J60-P-3A (3,000lb), North American T-2B Buckeye 2×J60-P-6 (3,000lb).

(J60-P-6) Configuration similar to JT12A. Take-off 3,000lb; pressure ratio 6.4:1; length 71.0in; diameter 22in; weight 494lb.

JT12A Civil single-shaft turbojet. Commercial counterpart to J60 military turbojet. Approximately 2,000 J60s and JT12As now built; production continues.

Applications Bell (Model 533) YH-40, 2×JT12A-3 booster units (3,000lb), Lockheed JetStar, 2×JT12A-6A (2,570lb), Lockheed Dash 8 JetStar, 2×JT12A-8 (3,300lb), Martin SV-5J, 1×JT12A (3,000lb), North American Sabreliner, 2×JT12A-6A (2,570lb), North American Sabreliner Series 40 & 60, 2×JT12A-8 (3,300lb).

(JT12A-8) Nine-stage compressor, annular combustor with nine flame tubes, two-stage turbine. Take-off 3,300lb; pressure ratio 6.7:1; length 78in; diameter 22in; weight 468lb.

J58/JT11D Military single-shaft augmented turbojet. Sole application is the Mach 3 Lockheed F-12A/SR-71.

Applications Lockheed F-12A, 2×JT11D-20B (approximately 34,000lb with afterburning), Lockheed SR-71, 2×J58 (approximately 34,000lb with afterburning).

(J58) Eight-stage compressor, annular combustor with eight flame tubes, two-stage turbine. Close-coupled afterburner with variable convergent-divergent ejector nozzle. Six external air ducts from compressor to afterburner provide low b.p.r. by-pass system.

J52/JT8 Military two-shaft turbojet. Provided the basis for the JT8D civil turbofan. Latest version now in production for US Navy is higher rated 11,200lb J52-P-400.

Applications Grumman A-6A, A-6B, A-6C, KA-6D, A-6E, EA-6A and EA-6B, 1×J52-P-8A (9,300lb), McDonnell Douglas A-4E Skyhawk, 1×J52-P-6A (8,500lb), McDonnell Douglas A-4F, TA-4F, A-4G Skyhawk and export counterparts, 1×J52-P-8A (9,300lb), McDonnell Douglas A-4M Skyhawk, 1×J52-P-400 (11,200lb), North American Rockwell AGM-28B Hound Dog, 1×J52-P-3 (7,500lb).

(J52-P-8A) Five-stage i-p compressor, seven-stage h-p compressor, annular combustor with nine flame tubes, single-stage h-p turbine, single-stage l-p turbine. Take-off 9,300lb; pressure ratio 12:1; length 117in; diameter 30.2in; weight 2,118lb.

JT4A Civil two-shaft turbojet. Commercial counterpart of J75 military turbojet.

Applications Boeing 707-220, 4×JT4A-3 (15,800lb), Boeing 707-320, 4×JT4A-9 (16,080lb) or JT4A-11 (17,500lb), McDonnell Douglas DC-8-20 and 30, 4×JT4A-9 (16,080lb) or JT4A-11 (17,500lb).

(JT4A-11) Eight-stage i-p compressor, seven-stage h-p compressor, annular combustor with eight flame tubes, single-stage h-p turbine, two-stage l-p turbine. Take-off 17,500lb; mass flow 256lb/sec; pressure ratio 12.5:1; length 144.1in; diameter 43.0in; weight 5,100lb.

J75 Military two-shaft augmented turbojet. Most powerful turbojet in the West to enter general military service.

Applications General Dynamics F-106A Delta Dart, 1×J75-P-17 (17,200lb or 24,500lb with afterburning), Lockheed WU/U-2A, 1×J75, Republic F-105B, 1×J75-P-5 (15,000lb), or 23,000lb with afterburning, Republic F-105D and F-105F Thunderchief, 1×J75-P-19W (17,200lb), or 26,500lb with afterburning and water injection), Republic F-105 Thunderstick 2, 1×J75.

(J75-P-19W) Eight-stage i-p compressor, seven-stage h-p compressor, annular combustor with eight flame tubes, single-stage