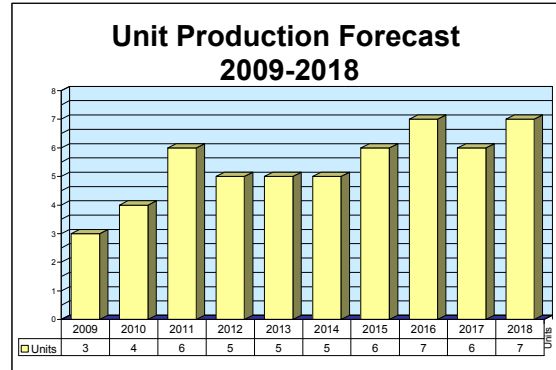


Fairchild Dornier 228

Outlook

- Switzerland's RUAG is developing new 228 Next Generation model; initial deliveries expected in 2010
- India's Hindustan Aeronautics Ltd produces a version of the Do 228 under license in India for the Indian military; will supply airframe for 228NG
- Indigenous Saras design supplanting the 228 in Indian military plans



Orientation

Description. Unpressurized, 15- to 19-passenger, twin-turboprop regional/commuter, utility and special-purpose military transport aircraft.

Sponsor. Dornier privately sponsored Do 228 development and production.

Licensee. Hindustan Aeronautics Ltd, Kanpur Division, Kanpur, India.

Status. Production by RUAG of Do 228NG now under way. Production in India ended in 2003 but was resumed in early 2005.

Total Produced. Through 1998, Dornier and Fairchild Dornier sold and delivered 175 Dornier 228s. HAL license-built and assembled approximately 68 through 2008.

Application. Short-range regional/commuter and executive passenger transportation. Additional applications include commercial and military freight transportation, maritime and border patrol, airborne early warning, and SIGINT.

Price Range. Production of new Do 228NG estimated \$7.7 million (EUR5.5 million) in 2009 dollars.

Contractors

Prime

Hindustan Aeronautics Ltd	PO Box 225, Kanpur, 208008 India, Tel: + 91 512 6 7088, Licensee
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Subcontractor

Hellenic Aerospace Industry - Athens Office	http://www.haicorp.com , Athens Tower, 2-4 Messoghion Ave, Athens, 115 27 Greece, Tel: + 30 210 77 99 622, Fax: + 30 210 77 97 670, Email: marketing@haicorp.com (Flap)
Hindustan Aeronautics Ltd	http://www.hal-india.com , 15/1 Cubbon Rd, PO Box 5150, Bangalore, 560 001 India, Tel: + 91 802 286 5197, Fax: + 91 802 286 7140 (Fuselage, Wings, and Empennage)
Honeywell Aerospace, Engines, Systems & Services	http://www.honeywell.com , 111 S 34th St, Phoenix, AZ 85034-2892 United States, Tel: + 1 (602) 231-1000, Fax: + 1 (602) 231-5713 (TPE331-5-252D Turboprop)

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Liebherr-Aerospace Lindenberg GmbH	http://www.liebherr.com , Postfach 1363, Pfaenderstr 50, Lindenberg, D-88161 Germany, Tel: + 49 8381 460, Fax: + 49 8381 464377, Email: info@li.liebherr.com (Hydraulic System)
MT-Propeller Gerd Muehlbauer GmbH	PO Box 0720, Straubing, D-94307 Germany, Tel: + 49 9429 94090, Fax: + 49 9429 8432, Email: sales@mt-propeller.com (Propeller)
Philips Elec & Assoc Industries Ltd	Arundel Great Ct, 8 Arundel St, London, WC2R 3DT United Kingdom, Tel: + 44 1 689 2166 (Marec II Radar)
Rockwell Collins Inc	http://www.rockwellcollins.com , 400 Collins Rd NE, Cedar Rapids, IA 52498-0001 United States, Tel: + 1 (319) 295-1000, Fax: + 1 (319) 295-5429 (Avionics)

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to www.forecastinternational.com (see Products & Samples/Governments & Industries) or call + 1 (203) 426-0800.

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

(228-212)

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Length overall	16.6 m	54.30 ft
Height	4.86 m	15.946 ft
Wingspan	16.97 m	55.68 ft
Cabin length	7.08 m	23.23 ft
Cabin height	1.55 m	5.086 ft
Cabin width	1.346 m	4.429 ft
Weight		
Max T-O weight	6,600 kg	14,520 lb
Max payload	2,201 kg	4,852 lb
Performance		
Takeoff run to 15 m (50 ft)	613 m	2,012 ft
Range with full payload	925 km	500 nm
Max speed	435 km/h	234 kt

Propulsion

Do 228-212 (2) Honeywell TPE331-10 turboprops rated 533 kW (715 shp), each driving a five-bladed MT propeller.

Seating

Commuter – Seating for 19 or 20.

Executive – Various seating configurations for 6 to 12 passengers.

Military – Depends upon mission and equipment package.

Variants/Upgrades

228-100. Original 15-passenger model sharing some commonality with Do 28 Skyservant, utilizing same main cabin door, cockpit equipment, fuselage sections.

228-101. Seats 16. Certificated in August 1984 at max gross weight of 5,980 kilograms (13,183 lb).

228-200. Similar to -100, but with fuselage stretch of 1.524 meters (5 ft) to seat 20 passengers.

228-201. The 40th aircraft off the Dornier line, this was certificated simultaneously with -101 and at same max gross weight.

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228-202. Compared with -201, this offers improved range/payload performance offset only by a slightly higher empty weight. Available from end of 1987.

228-203F. Announced for late 1987 availability, this freighter version features an additional crew door and higher payload/operating weights.

228-212. Similar to -201 but with increased landing weight to allow larger payloads for short-haul operations. Max TOW of 6,400 kilograms and landing weight of 6,100 kilograms. Uses 776-shp TPE331-5A, and employs strengthened landing gear, fuselage, and wing components. Other improvements are carbon brakes, modified anti-skid system, modified hydraulics, new electrically driven rudder trim unit, and dual rear fuselage strakes to improve low-speed handling. Certificated in 1989.

228 Next Generation. Updated variant launched by RUAG Aerospace in 2007 that uses upgraded 776-shp (580-kW) TPE331-10 engines. Other improvements include a new glass cockpit, avionics by Rockwell Collins, and five-bladed MT props. The new variant also includes aerodynamic improvements to the wing to boost short-field performance. Costs of restarting production of the 228 in Germany are kept low by making no changes to the design that require new certification or jigs.

Military/Government Variants. Dornier announced several military variants at Farnborough 1982. These are optimized for surveillance, maritime patrol, or special transportation roles in addition to normal utility transportation. The Indian Coast Guard ordered 36 maritime patrol versions from HAL. The Indian Air Force procured 25 HAL-built troop transports, while the Indian Navy acquired 30 fitted with anti-shipping missiles and Super Marec radar for the anti-ship role.

The Royal Thai Navy ordered three maritime patrol aircraft from Dornier in 1990, and the government of Mauritius took one from HAL for exclusive economic zone (EEZ) surveillance.

Specific variants are as follows:

228 Maritime Patrol A. One of three basic MPAs on offer. The A is designed for radar surveillance and patrol of the 200-nautical-mile economic zone, and for search and rescue. Four crew; equipment includes left- and right-side bubble windows, anti-skid flooring, MEL Marec II search radar, radar console flight and navigation instruments, OMEGA nav system, Agiflite camera with ONS interface, and outboard wet wing with provision for 2,250 kilograms of usable fuel.

228 Maritime Patrol B. Designed for pollution detection and source identification, plus general surveillance and search and rescue. Equipment includes Ericsson SLAR IR/UV scanner, OMEGA nav system, Nikon camera with navigation interface, a wet wing, and navigation/flight control instrumentation at the SLAR and IR/UV consoles.

228 Maritime Patrol C. Designed specifically for fishery patrol, coast guard work, and search and rescue. Basic equipment same as for B, but with Bendix/King RDR 1400 weather radar with ground mapping.

228 SIGINT. Signal intelligence, electronic intelligence, and communications/intelligence gathering with AEG electronic system fit.

228 Military Transport. Offered with troop, paratroop, and air ambulance interiors. Troop variant seats 17, 20, or 22. Paratroop model seats 21 fully equipped paratroopers, plus a jumpmaster. Ambulance carries six stretchers, and has nine seats for medical personnel and patients.

Program Review

Background. Dornier's original Light Transport Aircraft (LTA) concept was for an 18- to 25-seat aircraft to compete in the light utility/commuter transport market into the 1990s. It would also have applications in freight/cargo, VIP and military transport, maritime surveillance, and search and rescue. The concept was expanded to encompass a family of light transports.

TNT Wing Developed

In 1975, Dornier began development of an advanced-technology TNT wing (Tragflügel neuer Technologie) resembling the supercritical airfoils of high-speed jet transports. The TNT wing, when used on aircraft

operated in speed ranges up to about 509 km/h (275 kt), promised better lift and less drag than more conventional airfoils. TNT flight testing began in June 1979 and was completed in 1980. The wing was applied to the first of Dornier's family of light transports.

Indian Licensed Program

In 1983, Dornier and the Indian government signed an agreement covering licensed production of 228s by Hindustan Aeronautics Ltd (HAL). Through 1990, Dornier delivered 10 complete aircraft and 17 assembly kits, and the first Indian-assembled aircraft was rolled out in 1985. The HAL program originally envisioned a

Fairchild Dornier 228

minimum of 150 aircraft for operation by Vayudoot, Indian's third-level airline, and by India's armed forces. Vayudoot received 10; HAL also has marketing rights to the aircraft in 30 other countries.

Additional Orders?

In March 2005, India's Coast Guard ordered 11 more 228s and the line was reopened to build these. In late 2005 HAL noted that it was anticipating orders for 56 additional 228s, presumably all for the Indian armed forces. However, the Indian Air Force plans to replace its 228 with the indigenous Saras design and the Coast Guard is reportedly considering a similar move. These actions are expected to end demand for further domestic 228 sales.

Near the end of 2007, Switzerland's RUAG Aerospace announced that it was considering whether to launch a newly upgraded model of the Do 228 because of an increase in market demand for a 15-19 seat utility aircraft. RUAG had acquired the rights to the Do 228 and parts of the defunct Fairchild Dornier group years before.

Interest in turboprop-powered aircraft surged as fuel prices rose in the middle of the decade. As a result, RUAG's board of directors approved the plans to restart

production of the 228 in October 2007. At the time, the cost of bringing the aircraft back into production was estimated to be \$15.5 million.

Keeping costs contained is important to the program. As a result, RUAG has decided to make no changes to the aircraft that would affect its type certificate. Improvements to the aircraft such as the addition of Rockwell Collins avionics, a glass cockpit, a hydraulic system from Liebherr, and new five-bladed MT props have all already been certified under previously awarded supplementary type certificates. The company has said publicly that it will need to invest no more than EUR10 million in the program because it currently has the aircraft's jigs, drawings, and type certificate, so the risk in moving ahead with production appears to be relatively low. An official at RUAG promised a 15 percent lower fuel burn from the aircraft's Honeywell TPE331-10 engines.

HAL will continue to build the aircraft's fuselage, empennage and other structural parts in India, but final assembly of the aircraft will be completed at the former Dornier plant in Oberpfaffenhofen, Germany (outside Munich). The first delivery of the Do 228 Next Generation to a customer is scheduled for 2010.

Contracts/Orders & Options

(June 2009)

Operator	Designation	Quantity	Phase
Air Cancun	Do 228-201NG	1	Order
India Air Force	Do 228-201	3	Order
Undisclosed customers	Do 228-201NG	7	Order
Undisclosed customers	Do 228-201NG	5	Option

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Early	1978	LTA development announced
Jun	1979	First flight tests of TNT wing
Mar	1981	Model 228-100 prototype first flight
May	1981	Model 228-200 prototype first flight
Feb	1982	Initial -100 deliveries
Late	1982	Initial -200 deliveries
Nov	1983	HAL licensed agreement signed
Aug	1984	German certification of -101 and -201 versions
Late	1985	Roll-out of first HAL-assembled 228
Jun	1990	U.S. and French certification of Dash 212

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<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Mid	1996	Fairchild acquires majority share of Dornier
	1997	All Dornier 228 production shifted to HAL
	2002	HAL licensed production resumed
	2003	HAL production ends
Early	2005	Production resumed at HAL to fill 11-unit order
	2010	Expected first delivery of RUAG Do 228 Next Generation

Worldwide Distribution/Inventories

(As of June 2009)

Operator	Designation	Quantity
A Soriano Aviation Inc	Do 228-202	2
Advanced Aviation	Do 228-200	1
Aero Cardal Ltda	Do 228-100	1
Aero Cardal Ltda	Do 228-200	1
Aerocondor	Do 228-200	1
Aerocondor	Do 228-202	1
Agni Air	Do 228-101	1
Air Caledonie	Do 228-200	1
Air Caraibes SA	Do 228-202	1
Air Caraibes SA	Do 228-212	2
Air Marshall Islands Inc	Do 228-212	1
Air Tahiti SARL	Do 228-212	1
Air-India Ltd	Do 228-201	2
Airlines of Tasmania (Ceased Operations)	Do 228-200	1
American Jet SA	Do 228-201	1
Angola Air Force	Do 228	1
Arctic Air AB	Do 228-202	1
Arcus-Air Logistic GmbH & Co KG	Do 228-212	2
Bhutan Army	Do 228	1
Bighorn Airways	Do 228-202	3
Businesswings Luftfahrtunternehmen GmbH	Do 228-100	1
Cosmic Air Pvt Ltd	Do 228-202	1
Daily Air Corp	Do 228-212	2
DANA - Dornier Aviation Nigeria AIEP Ltd	Do 228-201	2
DANA - Dornier Aviation Nigeria AIEP Ltd	Do 228-202	7
Direktflyg	Do 228-100	1
DLR Flugbetriebe	Do 228-101	4
Dolphin Air	Do 228-201	2

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Operator	Designation	Quantity
Dornier	Do 228-200	1
Dornier	Do 228-202	1
Finland Frontier Guard	Do 228-212	2
FRAviation	Do 228-200	2
FRAviation	Do 228-201	1
Gorkha Airlines Pvt Ltd	Do 228-200	1
Gorkha Airlines Pvt Ltd	Do 228-202	1
India Air Force	Do 228-201	45
India Coast Guard	Do 228-101	21
India Coast Guard	Do 228-201	3
India Government	Do 228-201	2
India Navy	Do 228-101	1
India Navy	Do 228-201	10
Iran Aseman Airlines - IAA	Do 228-212	4
Island Aviation Ltd	Do 228-212	2
Island Transvoyager Inc	Do 228-200	1
Italy Army	Do 228-200	4
Jagson Airlines	Do 228-200	1
Jagson Airlines	Do 228-201	2
Japan Government	Do 228-200	1
Landsflug ehf (Air Domestic)	Do 228-201	1
LGW Luftfahrtgesellschaft Walter MbH	Do 228-100	2
LGW Luftfahrtgesellschaft Walter MbH	Do 228-200	1
LGW Luftfahrtgesellschaft Walter MbH	Do 228-201	2
LGW Luftfahrtgesellschaft Walter MbH	Do 228-202	1
Lufttransport A/S	Do 228-202	2
Malawi Air Force	Do 228	4
Mandarin Airlines Ltd	Do 228-202	1
Mauritania Air Force	Do 228	1
Netherlands Air Force	Do 228-212	2
New Central Aviation - NCA	Do 228-212	1
Niger Air Force	Do 228-201	1
Nigeria Air Force	Do 228-201	2
Nigeria Air Force	Do 228-212	3
Oman Police	Do 228-100	1
Pelangi Airways	Do 228-202	1
PMAS Regional Airlines(Nigeria) Ltd.	Do 228-100	1
Precision Airlines (Northwest Airlink)	Do 228-202	2

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Operator	Designation	Quantity
SAPSA - Servicios Aereos Petroleros SA	Do 228-202	1
SATA Air Acores	Do 228-202	1
Scotairways	Do 228-200	1
Somali Airlines SpA	Do 228-202	1
South East Asian Airlines Inc (Seair)	Do 228-200	2
Summit Air Charters Ltd	Do 228-201	1
Summit Air Charters Ltd	Do 228-202	4
Thailand Navy	Do 228	7
Uni-Fly A/S	Do 228-202	1
Vision Airlines Inc	Do 228-202	4
Vision Airlines Inc	Do 228-202F	1
VSA Aviation CC	Do 228-201	1
Wells Fargo	Do 228-202	1
Wells Fargo	Do 228-212	1

Forecast Rationale

The Do 228 is currently in production in two nations. In India, Hindustan Aeronautics Ltd (HAL) has built the 228-200 under license in small quantities for the Indian military. Production of the Do 228 in Germany ended in 1998. However, Swiss manufacturer RUAG is in the process of restarting production of this unpressurized, 19-seat, twin-engine turboprop commuter airliner in Oberpfaffenhofen, Germany.

The new "Next Generation" model is based on the existing 228-212 variant. It will feature a new glass cockpit made by Rockwell Collins and use Honeywell TPE331-10 engines equipped with five-blade composite propellers. The 228NG will also feature coupled aileron droop to increase short-field performance.

The aircraft will be directed at the traditional segments of the utility market. It is a niche product and will be targeted at operators flying existing Do 228s, de Havilland Canada DHC-6 Twin Otters, and other utility aircraft off remote, short or unpaved runways. The company will also target the aircraft toward the paramilitary market for use as a surveillance and patrol aircraft.

RUAG sees a market for 60-80 aircraft over the next 10 years, and it estimates that it can break even by building

as few as 40 new aircraft. The company had a reported backlog of only eight aircraft through June 2009, but it notes that it has received inquiries from 40-50 customers. Fuel prices have fallen off the highs seen in 2008, but they remain elevated relative to the prices seen in the 1990s. The cost of fuel is driving a renewed interest in turboprops by commuter airlines and the special mission market, and our forecast assumes this trend will continue.

HAL will be an important part of the new program. Under a new deal signed between RUAG and HAL during the 2008 Berlin Air Show, HAL will supply the wings, fuselage, and empennage for the new Do 228NG model, lowering production costs. RUAG will handle final assembly at the old Dornier plant in Germany, though the parties have left open the possibility that HAL could eventually build the entire aircraft in India.

Including production by HAL in India for the Indian military, we are forecasting production of 54 Do 228s during the 2009-2018 forecast period. An existing 228-212 will be upgraded with new equipment for use as a flight test aircraft, and, as a result, production of a prototype is not reflected in our forecast.

Fairchild Dornier 228**Ten-Year Outlook**

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program	High Confidence				Good Confidence			Speculative			Total	
	Thru 2008	2009	2010	2011	2012	2013	2014	2015	2016	2017		2018
Hindustan Aeronautics Ltd												
228 -200/-201 <> TPE331 -5 Military												
	68	3	0	0	0	0	0	0	0	0	0	3
RUAG Aerospace												
228 New Generation <> TPE331 -10 Civil												
	0	0	4	6	5	5	5	6	7	6	7	51
Total	68	3	4	6	5	5	5	6	7	6	7	54