

Jane's Defence Weekly

BRIC watching

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Brazil, Russia, India, and China are continuing to develop manned airborne surveillance aircraft. Martin Streetly reports

Despite increasing access to overhead reconnaissance assets and increasing use - or at least increasing interest in - unmanned aerial vehicles, the BRIC nations (comprising Brazil, Russia, India, and China) are continuing to develop and field airborne manned surveillance assets that contain indigenous content to a greater or lesser extent.



The EMB-145 RS/R-99 remote-sensing aircraft is equipped with a multiband SAR radar, FLIR, IR/ultra-violet/visible light scanner, and communications band ES system. (Embraer)

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The Brazilian Air Force (Força Aérea Brasileira: FAB) deploys the Embraer EMB-145RS (FAB designation: R-99) remote-sensing platform as part of the country's Amazon Surveillance Program (SIVAM). This programme is designed to monitor activity within the Amazon basin and is best regarded as a 'system of systems' that incorporates air traffic control/surveillance/weather radars, EMB-145SA airborne early warning and EMB-145RS surveillance aircraft, weather/lightning/hydrological sensors, satellite imagery receivers, airport instrument landing systems, HF direction-finders, air traffic control and co-ordination centres, and flight inspection aircraft. Key programme objectives include environmental protection, law enforcement support, protection of indigenous peoples, prevention and control of disease, border surveillance, river navigability monitoring, air traffic control, and support for regional development within the area.

First delivered during July 2002, the EMB-145RS is equipped with a mission suite that includes a MacDonald Dettwiler multimode/band synthetic aperture radar (SAR), a FLIR Systems Star Safire forward-looking infrared (FLIR) sensor, an Argon ST combined ultra-violet/visible light/IR scanner, a Communications/Non-Communications Signals Exploitation (SE) system and a datalink. The SAR used operates in both the L- (1 to 2 GHz) and X- (8 to 12.5 GHz) bands, with the former being noted as a multipolarimetric application and the latter as offering interferometer, SAR, inverse SAR, moving target indication, and air-to-air capabilities. Resolution is selectable from 'high', 'medium', and 'low' options (believed to be three, six, and 18 m in SAR strip map mode) and the equipment's swath is given as being between 20 and 120 km. The sensor can record up to five channels of data (quad L + X) simultaneously and its slant range is believed to be in the region of 120 km when operating from an altitude of 10,058 m (33,000 ft).

Externally, the EMB-145RS is characterised by a FLIR turret housing beneath its cockpit, a three-part radar antenna assembly, a ventral SE radome (located just aft of the ventral radar fairing), a ventral datalink antenna housing (on the aircraft's belly just aft of its wing trailing edges) and twin ventral stabilising surfaces beneath its tail unit. The FAB has procured three R-99s that, at the time of writing, were assigned (alongside five EMB-145SA/E-99 airborne early warning platforms) to the 2° Esquadrão (Squadron) of the service's 6° Grupo de Aviação (GAv - Aviation Group) based at Anápolis in Brazil's Goiás State.

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Although of relatively poor quality, this hand-held camera shot of an Il-20M that was intercepted over the Sea of Japan is indicative of the type's baseline configuration. (Japanese MoD)

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Sources suggest that the type's baseline ELINT capability incorporated a six-console operator 'complex' (the Russian term for an equipment suite) located in the middle of its main cabin. Of the two onboard systems, the Kvadrat-2 has been associated with an array of six suppressed antennas (located in threes on either side of the aircraft's rear fuselage) and is quoted as having been an analysis facility that was able to determine the bearings, frequencies, pulse repetition frequencies, pulse-lengths, and amplitudes of received signals. The Romb-4 is described as having been able to establish emitter bearing and frequency, with alternate designations SRS-6A and SRS-7 in its Romb-4A and Romb-4B configurations respectively. When applied to the 'Coot-A' it made use of reception arrays located in the rear sections of the type's forward fuselage slab fairings. Russian sources describe the SRS-6A configuration as having been fully automated, covering a total of 34 frequency bands and being able to monitor and record (on film) pulsed radar transmissions from a system-specific range of emitters. Other cited features include simultaneous reception of pulsed signals within a defined frequency range, automatic signals recording, visual warning of radar illumination (on both sides of the host platform), and a post-mission analysis capability that was able to deduce the wavelength and other parameters of recorded signals. The baseline Il-20M's ELINT capability is also likely to have made use of a third set of antennas that were mounted in a series of ventral blister fairings along the aircraft's belly. The Vishnya ES system is reported to have been a single-operator equipment and made use of two large blade aerials mounted above the Il-20M's forward fuselage and/or an array of five blades located beneath its rear fuselage.

Alongside the six-man (subsequently increased to eight) signals intelligence (SIGINT) operator crew and the single ES operator, the baseline Il-20M had accommodation for a camera operator and a five-man flight crew. All of the platform's original crew seats were able to accommodate parachute packs and sources suggest that there was an escape hatch/chute arrangement that exited via what in the Il-18D had been the baggage hold access hatch. Other type-specific modifications included the removal of most of the Il-18D's cabin furniture, some local airframe strengthening and the introduction of a nosewheel mudguard to prevent foreign object damage to the type's ventral antenna housing. JSC 'Aviaremont' notes the type as having a crew rest area in the rear of its main

cabin. Whether or not this description refers to the original Il-20M or to one of its upgraded configurations remains unclear.

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On 1 November 2013 the JASDF took this photograph of an Il-20M that exhibited what was then the type's latest external configuration. (Japanese MoD)

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Subsequent to this first batch of upgrades, 1 November 2013 saw the Japan Air Self-Defence Force (JASDF) intercept an Il-20M above the strait between Kyushu and the Korean peninsula that exhibited a radically new appearance. Here (and alongside the standard forward fuselage camera ports, ventral SLAR pod, and Vishnya ES system), the platform was fitted with two thimble radomes beneath its rear fuselage, a major new feature aft of the trailing edge of at least its port wing, and two new slab fairings scabbed onto the side and bottom of at least the port side of its rear fuselage. Of these, the feature aft of the aircraft's port wing was of considerable size and featured a two-axis, faceted outer face.

The Il-20M entered operational service during 1970, with the surviving members of the fleet being thought to be assigned to VVS Independent Reconnaissance Flights (ORAO). Each ORAO typically fielded two aircraft and was flown by the VVS on behalf of Russian military intelligence. The period 29 January 2010 to 9 March 2011 saw the JASDF intercept Il-20Ms over the Sea of Japan on at least 12 occasions, with further sightings of single aircraft occurring on 2, 14, and 15 November 2012 and on 27 December. Elsewhere in the world, 3 June 2013 saw a pair of French Air Force Mirage F1CR fighters intercept a 'Coot-A' off the coast of Lithuania. The JASDF spotted and photographed the latest known Il-20M configuration on 1 November 2013.

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Externally the Tu-214R is characterised by box-shaped fairings scabbed onto either side of its forward fuselage just aft of its cockpit, an arrangement of a satellite communications antenna radome (forward), and a linear equipment fairing on top of its centre fuselage. There is a double-tiered equipment fairing beneath its forward fuselage aft of its nosewheel bay, a small circular radome on its centreline just aft of the leading edges of its wings, large equipment housings that are faired into the trailing edges of the aircraft's wings and extend back as far as the last main cabin windows on both sides of its rear fuselage, and an arrangement of one large (forward) and one smaller radome along its centreline beneath its rear fuselage. The small belly radomes appear to be associated with a pair of substantial cruciform antenna arrays mounted on the sides of the aircraft's fuselage.

The forward fuselage box fairings have been associated with the MRK-411 radar and are grouped with square and round sensor port-type features ahead and behind the main fairings respectively. The housing beneath the aircraft's forward fuselage is likely to house the platform's EO sensor and features large rectangular and smaller aerodynamically shaped sub-fairings, with the latter incorporating either a dielectric section or a sensor port covering forward. It has been suggested that the equipment housings that reach back from the aircraft's wing trailing edges house power generation and/or self-defence equipment, while the large ventral radome beneath the aircraft's rear fuselage appears to be connected with the MRK-411 radar. The port and starboard cruciform antenna arrays (together with the pair of small belly radomes) have been linked with the type's CNIRTI SIGINT package and the Tu-214R is noted as incorporating a dorsal satellite communications antenna radome above its centre fuselage. Aside from CNIRTI, TPC Linkos, and Vega REC, airframer OAO KAPO 'S P Gorbunov' is reported to be involved in the programme.



An in-flight photograph of the prototype Tu-214R taken from a JASDF interceptor over the Sea of Japan on 18 December 2012. (Japanese MoD)

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In programmatic terms, a complete Tu-214R mission 'complex' is said to have been available for ground testing during early 2008, with the type making its maiden flight on 24 December 2009. Thereafter, the Tu-214R underwent flight tests at OAO KAPO S P Gorbunov's facility at Kazan in the Tatarstan Republic during the early part of 2012. By mid-year local media reported that the GRU had begun litigation against the Tu-214R's airframer over a series of programme delays. The primary problem was associated with the platform's mission suite and the judges in the case had awarded the GRU some RUB180 million (USD5.5 million) in damages. The first of the two Tu-214Rs then on order was photographed by the JASDF over the Sea of Japan on the 17 and 18 December 2012. The following January Russian newspaper Izvestia carried an article suggesting that the GRU was contemplating refusing to accept the second Tu-214R following initial operations with the first aircraft.

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A ground view of HAL Do 228-201 information warfare aircraft BNS serial number IN-232 that shows the three port ES/ELINT antenna assembly installed on its port wingtip. (IHS/Patrick Allen)

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Within the Indian domain, the Indian Navy's No 310 'Cobras' Squadron (based at Indian Naval Station (INS) Hansa, at Dabolim in Goa, is understood to operate an inventory of Hindustan Aerospace Ltd-built Do 228-201 aircraft in the 'information warfare' role. The sensor fit includes a belly-mounted surveillance radar and an ES/ELINT system. Do 228-201 information warfare aircraft IN-223 has been

photographed with what appear to be four reception arrays located fore and aft on both sides of its fuselage, while aircraft IN-232 has been logged with a three-port array located on each of its wingtips. Interestingly, this aircraft appears to show evidence that it was once equipped with a similar array to that fitted to IN-223. Indian sources suggest that IN-232 acquired its six-port array post-2003 and that the installation serves a 0.5 to 18 GHz-band Elisra Group AES-210/E Emerald ES/ELINT system. Against this, the latest known AES-210/E installations make use of fundamentally different antenna configurations to that exhibited by IN-232 and it is possible that IN-232 is equipped with a variant of Bharat Electronics' Airborne ES System, which has been promoted for use aboard the Do 228. Aircraft IN-232 is reported to have been retrofitted with an Elta Systems EL/M-2022A(V)3 maritime surveillance radar as a precursor to a major upgrade programme that would see the BNS's 'information warfare' Do 228-201s equipped with a mission suite that would be built around an ES/ELINT system; the cited EL/M-2022A(V)3 radar; a Tamam Airborne Multi-mission Optronic Stabilised Payload; a ring laser gyro inertial navigation/GPS package; mission commander, observer, and radar stations; and a real-time datalink. Over time the update package does not appear to have been implemented.



An in-flight view of a PLAAF Tu-154 reconnaissance aircraft that was intercepted by the JASDF over the East China Sea during November 2013. (Japanese MoD)

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In terms of usage an insight into Indian Naval Air Squadron (INAS) 310's activities can be gained from its participation in the 1999 Kargil War between India and Pakistan. Three Do 228-201s and approximately 50 squadron personnel were deployed from INS Hansa to Naliya in Gujarat for participation in Operation 'Vijay'. The deployment's initial sortie was conducted over the Arabian Sea

and is claimed to have identified Pakistani ground radars at Karachi, Khetibandar, Malir, Ormara, and Pasni, as well as airborne systems aboard Pakistani Breguet Br.1150 Atlantic and Lockheed Martin P-3 Orion maritime patrol aircraft. During June 1999 the unit undertook a second serial of 'Vijay' ELINT sorties from Naliya, with missions being flown over the Kori Creek (Gujarat) - Bikaner (Rajasthan) area and along the Indo-Pakistani border.

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An in-flight view of a Y-8JB SIGINT aircraft that shows many of the antennas and equipment features that characterise the type's external appearance. (Chinese internet)

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The manned airborne surveillance capability generated by the remaining BRIC nation - China - is currently built around 'special mission' variants of the Tupolev Tu-154 airliner and the Shaanxi Y-8 transport aircraft. The People's Liberation Army Air Force (PLAAF) has over time operated at least four Tu-154s configured for SIGINT (including aircraft B-4018) and an as-yet-unidentified role that involves the installation of a large canoe fairing beneath the forward fuselages of at least three other Tupolevs. Aircraft B-4018 is thought to have entered service during 1998, with one of the three canoe-equipped platforms (aircraft B-4015) being intercepted most recently by the JASDF on 17 and 23 November 2013.



An in-flight view of a Y-8CB SIGINT aircraft that was intercepted by the JASDF over the East China Sea on 23 November 2013. (Japanese MoD)

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The Y-8 capability forms part of the 'Gaoxin' ('High New') programme and involves the Y-8CB ('Gaoxin-1'), Y-8G ('Gaoxin-3'), and Y-8JB ('Gaoxin-2') SIGINT platforms.

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