

SP's



AN SP GUIDE PUBLICATION

MAI

₹55.00 (INDIA-BASED BUYER ONLY)



ISSN 2230-9268

DEFEXPO 2018
SPECIAL

Visit us @
Hall 6
Stall 6.2.10

Vol: 8 Defexpo 2018 Special

www.spsmai.com

ONLY FORTNIGHTLY ON **MILITARY AEROSPACE INTERNAL SECURITY**



Page 6

India-France Re-energising Ties



Can India afford to
'chill-out' about China? PAGE 9



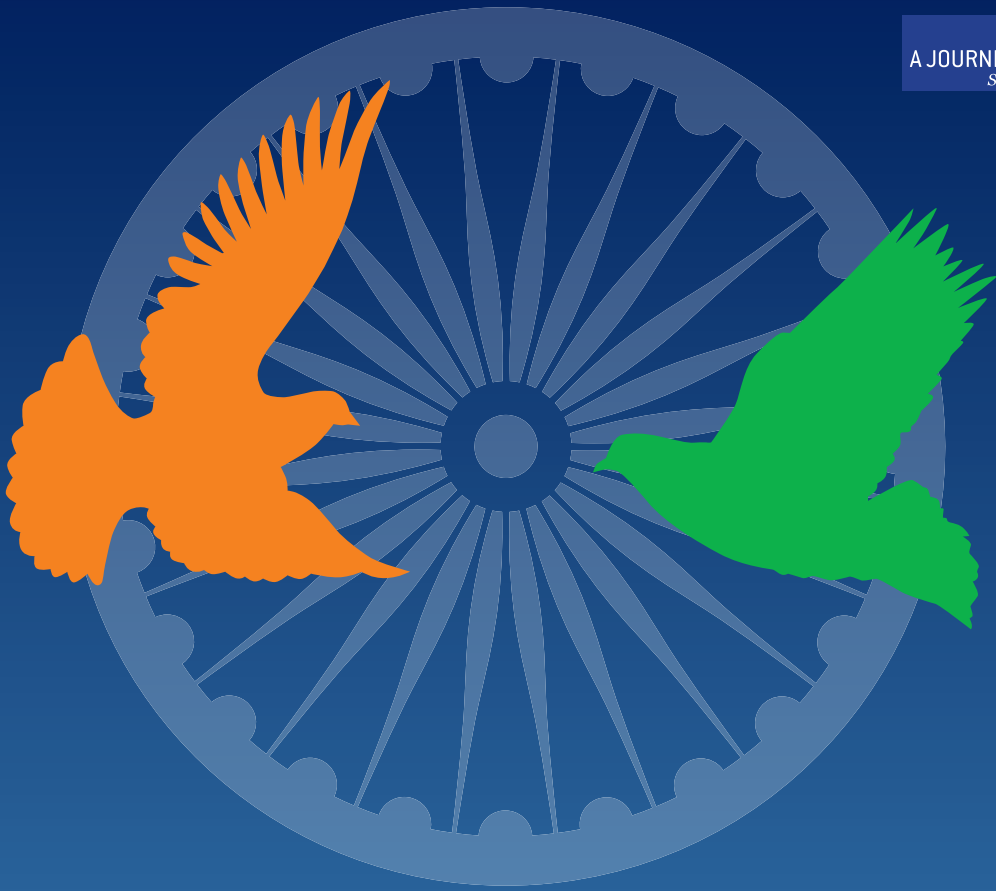
Defence Minister initiates
development of Tamil Nadu
defence corridor at defence
industry meet PAGE 13

FROM THE
EDITOR'S DESK 4
SECURITY BREACHES 22

MILITARY
Report 12
Viewpoint 11, 15
Updates 13

AEROSPACE
Report
Viewpoint
Developments

CORPORATE
News 21
16
19
20



“In a country like India with limited support from the industry and market, initiating 50 years ago (in 1964) publishing magazines relating to Army, Navy and Aviation sectors without any interruption is a commendable job on the part of SP Guide Publications. By this, SP Guide Publications has established the fact that continuing quality work in any field would result in success.”

Narendra Modi, Hon'ble Prime Minister of India (*message received in 2014)



SP GUIDE PUBLICATIONS

Admiral Sunil Lanba, Chairman, Chiefs of Staff Committee and the Chief of the Naval Staff visits USA

Admiral Sunil Lanba, Chairman, Chiefs of Staff Committee and the Chief of the Naval Staff visited USA on a bilateral visit from March 19 to 23, 2018. The visit aimed to consolidate cooperation between the Armed Forces of both India and USA and also to explore new avenues of defence cooperation.

During his visit, the Chairman, Chiefs of Staff Committee and the Chief of the Naval Staff held bilateral discussions with James Mattis, Secretary Defence (SECDEF) of USA, Richard V. Spencer, Secretary of the Navy (SECNAV), General Joseph F Dunford Jr, Vice Chairman Joint Chiefs of Staff (Vice Chairman JCS), Admiral John M. Richardson, Chief of Naval Operations (CNO), Admiral Harry Harris, Commander, Pacific Command (PACOM), Admiral Scott



Admiral Sunil Lanba with Admiral Scott Swift, Commander, Pacific Fleet

Swift, Commander, Pacific Fleet (PACFLT), and Vice Admiral Thomas J Moore, Commander, Naval Sea Systems Command (NAVSEA).

In addition to holding important bilateral discussions, the Admiral also visited the Pacific Command Headquarters at Pearl Harbour, Hawaii, the Naval Surface Warfare Centre (NSWC) Dahlgren, the Pentagon and Arlington National Cemetery in Washington DC.

India and USA have traditionally maintained close and friendly relations, including defence relation, wherein both countries have concluded major agreements in the recent past. This includes the Defence Framework Agreement, signed in 2015, which lays a blue print for collaboration between the defence establishments of both countries and the Logistics Exchange Memorandum of Agreement (LEMOA) signed in 2016, which is a foundational agreement, facilitating reciprocal logistics support between the Armed Forces of both countries. In addition, India was accorded Major Defence Partner status during the Prime Minister's visit to US in June 2016. **SP**



Cover:

The strategic partnership with France will help India achieve its aspirations to play a much larger role in the world and especially in the Indo-Pacific region.

Cover images: PIB

PUBLISHER AND EDITOR-IN-CHIEF
Jayant Baranwal

DEPUTY MANAGING EDITOR
Neetu Dhulia

SR TECHNICAL GROUP EDITORS
Air Marshal B.K. Pandey (Retd)
Lt General Naresh Chand (Retd)
Lt General V.K. Kapoor (Retd)
R. Adm S.K. Ramsay (Retd)

ASSISTANT FEATURES EDITOR
Arpita Kala

PRINCIPAL CORRESPONDENT
Rohit Srivastava

SPECIAL CONTRIBUTOR
Lt General P.C. Katoch (Retd)

CHAIRMAN & MANAGING DIRECTOR
Jayant Baranwal

PLANNING & BUSINESS DEVELOPMENT
Executive Vice President: Rohit Goel

ADMIN & COORDINATION
Bharti Sharma

ASST - ADMIN, HR & INFRA
Pooja Tehlani

DESIGN & LAYOUT
Creative Director: Anoop Kamath
Designers: Vimlesh Kumar Yadav,
Sonu Bisht
Research Assistant - Graphics:
Survi Massey

SALES & MARKETING
Director: Neetu Dhulia
General Manager Sales: Rajeev Chugh

SP'S WEBSITES

Sr Web Developer: Shailendra P. Ashish
Web Developer: Ugrashen Vishwakarma

© SP Guide Publications, 2018

SUBSCRIPTION/CIRCULATION

Annual Inland: ₹1,320 • Foreign: US\$ 325
E-mail: subscribe@spguidepublications.com
subscribe@spsmai.com

LETTERS TO THE EDITOR

editor@spsmai.com

FOR ADVERTISING DETAILS, CONTACT:

advertise@spsmai.com
neetu@spguidepublications.com
rajeev.chugh@spguidepublications.com

SP GUIDE PUBLICATIONS PVT LTD

A-133 Arjun Nagar
(Opposite Defence Colony)
New Delhi 110003, India.

Tel: +91 (11) 24644693,
24644763, 24620130
Fax: +91 (11) 24647093
E-mail: info@spguidepublications.com

REPRESENTATIVE OFFICE

204, Jal Vayu Vihar
Kalyan Nagar
Bengaluru 560043
Tel: +91 (80) 23682204

MOSCOW, RUSSIA

LAGUK Co., Ltd, Yuri Laskin
Krasnokholmskaya, Nab.,
11/15, app. 132, Moscow 115172, Russia.
Tel: +7 (495) 911 2762,
Fax: +7 (495) 912 1260

Owned, published and printed by Jayant Baranwal, printed at Kala Jyothi Process Pvt Ltd and published at A-133, Arjun Nagar (Opposite Defence Colony), New Delhi 110003, India. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, photocopying, recording, electronic, or otherwise without prior written permission of the Publishers.



SP GUIDE PUBLICATIONS

www.spguidepublications.com



India-France ink 14 key agreements during French President's visit

France has had a strong relationship with India for approximately the last six decades. France remains a major partner of India in developing various key military platforms. The two navies regularly conduct joint naval exercises named 'Varuna' since 2000. During President Macron's visit to India during March 2018, India and France inked 14 key agreements in strategic areas of security, nuclear energy, and protection of classified information. President Macron said, "We want India as our first strategic partner here, and we want to be India's first strategic partner in Europe, and even the western world." France supports India's bid to the NSG and UNSC and both have reiterated their support to the Indian Ocean Rim Association (IORA).

There is a detailed exposure on the impact of Xi Jinping being made President for Life on March 20, 2018, when he stated that, "the Chinese people have been indomitable and persistent. We are resolved to fight the bloody battle against our enemies, and on the basis of independence we are determined to recapture the relics." India's problems with China span illegal Chinese claims in Arunachal Pradesh, Eastern Ladakh and Doklam stand off. The presence of the reverent 14th Dalai Lama and the Tibet Government in Exile raises hackles of the Chinese Government to no end. Chinese Foreign Minister Wang Yi told the media in Beijing in March 2018, "Despite some tests and difficulties, the China-India relationship continues to grow. ...China is upholding its rights and India... Chinese dragon and Indian elephant must not fight each other but dance with each other.... If China and India are united, one plus one will become eleven instead of two. With political trust, not even the Himalayas can stop us from friendly exchanges." But China must walk the talk.

The another article on China, Arpita Kala of *SP's M.A.I.*, asks a rhetoric question whether India afford to 'chill-out' about China? The answer obviously is NO as supported by quoting views of former Army Chief General V.P. Malik and former Air Chief Marshal Fali Homi Major. In the post Doklam view the author details out the steps India is taking to reinforce the border.

The other key event which took place Ammo India 2018 held on March 12 which is claimed as the 1st International Conference on Military Ammunition. The Defence Minister Nirmala Sitharaman, has underlined the need for revitalising defence PSUs and ordnance factories for meeting the ammunition needs of India's defence forces. She qualified by saying that the, "the managements of these organizations need to be ahead of the curve and show dynamism as they possess immense and valuable assets that could offer manufacturers huge production opportunities".

China's TV channel recently showed video footage of a Type 59 based tank being controlled by a soldier sitting in front of a computer terminal with a steering wheel, which caught the imagination of the world. Chinese media Sohu reported that the footage was made in the 'Unmanned Battle Systems Lab of PLA'. This is not a surprising news as China is going at break neck speed to catch up with the military technologies of the West. Then there are write-ups on other developments in the military and aerospace field including key news items which just about wraps up this issue.

We hope that you discerning readers enjoy reading this issue and if you are in Chennai between April 11 to 14, do visit our Hall 6, Stall 6.2.10.

Jayant Baranwal
Publisher & Editor-in-Chief

TERRA Early Warning Radars



ULTRA
UHF Band Radar

SPECTRA
S-Band Radar

TERRA Dual UHF and S-Band Radar System for Early Warning and Long-Range Search & Track

- Scalable ULTRA UHF radar and SPECTRA S-Band radar
- Designed for anti-ballistic missile and air defense
- Ground or shipborne
- Detection of low RCS airborne platforms
- Operationally proven

www.iai.co.il • market@elta.co.il

SEE US AT
DEFEXPO INDIA 2018
Hall 1, Booth 1.1.4a





LT GENERAL
PC. KATOCH (RETD)

20 Years of Indo-French Partnership



Prime Minister Narendra Modi and the President of the French Republic, Emmanuel Macron witnessing the exchange of agreements between Minister of the French Armed Forces Florence Parly and Defence Minister Nirmala Sitharaman in New Delhi on March 10, 2018

France was the first country in the world with which India signed a strategic partnership in 1998; between French President Jacques Chirac and Prime Minister Atal Behari Vajpayee. Indian space scientists received initial training in France after Pokhran-II, France recognising India as responsible nation while balance West blocked out India. French President Emmanuel Macron's recent four-day visit to India in March 2018 coincided with 20 years of the strategic partnership between the two countries. President Macron arrived at New Delhi on March 9 accompanied by his Brigitte Marie-Claude Macron (First Lady of France), businessmen and top officials. President Macron met President Ramnath Kovind and held discussions with him.

President Macron and Prime Minister Modi held discussions on how to further enhance ties between their two countries including in key areas of defence, space and civil nuclear cooperation. This was followed by delegation-level talks between the India and France led by the two leaders, exchange of agreements, followed by a joint press statement by President Macron and Prime Minister Modi.

Later Macron attended a CEOs forum, interacting with industry heads and top CEOs. Macron also interacted with students from across India in another event. The International Solar Alliance (ISA), co-chaired by Prime Minister Modi and President Macron, was formally kicked off in presence of heads of state of 23 countries and ministerial representatives from 10 other nations, with 62 member-



(Left) President Ram Nath Kovind and Prime Minister Modi with President Emmanuel Macron during the ceremonial reception at the Rashtrapati Bhavan in New Delhi; (right) Prime Minister Modi and President Macron at the Founding Conference of the International Solar Alliance at Rashtrapati Bhavan in New Delhi.



countries adopting the 'Delhi Solar Agenda' seeking to raise the share of solar power in their energy basket with a view to mitigating climate change and providing clean, affordable electricity to the underprivileged. President Macron and Prime Minister Modi also visited Varanasi and later Mirzapur in UP to inaugurate a 100 MW solar power plant – the largest in Uttar Pradesh.

Defence cooperation between France and India has been growing steadily too. The multi-billion dollar deal for 36 Rafale fighters was signed in 2016. France remains a major partner for India in developing various key military platforms including the Scorpène submarines. During the visit of French Defense Minister Florence Parly in October 2017, foundation stone for the Dassault Reliance Aerospace Limited (DRAL) manufacturing facility was laid at Mihan in (Maharashtra); joint venture France's Dassault Aviation and Reliance Group – first private facility for production of Rafale fighter jets and Falcon civilian aircraft.

The two navies regularly conduct joint exercises and their scope has been widening over the years. The 'Varuna' series of joint maritime exercises began in 2000 and have become integral to institutionalised interactions between the two navies.

During President Macron's visit, India and France inked 14 key agreements in strategic areas of security, nuclear energy, and protection of classified information, while companies from both countries signed contracts worth \$16 billion. The agreements, included those in the field of defence, education, environment, urban development and railways, etc, details of some of which are: agreement for Exchange and Reciprocal Protection of Classified or Protected Information; agreement for annual defence dialogue at ministerial level; agreement for provision of reciprocal logistics support between their Armed Forces extending logistical support on reciprocal access to respective facilities for Indian and French armed forces; agreement on Prevention of the Illicit Consumption of and Reduction of Illicit Traffic in Narcotic Drugs, Psychotropic Substances and Chemical

Precursors; Way Forward Agreement between NPCIL and EDF for the Implementation of six nuclear power reactor units at Jaitapur, Maharashtra, India; bilateral partnership agreement on migration and mobility, to facilitate student and professional mobility between both countries; agreement for mutual recognition of degrees, to facilitate pursuit of higher education and enhancing their employability; signing of a Statement of Intent between the French Ministry for Ecological and Inclusive Transition and NITI Aayog, supported by French technical assistance provided by French Development Agency (AFD).

President Macron said, "We want India as our first strategic partner here, and we want to be India's first strategic partner in Europe, and even the western world." France supports India's bid to the NSG and UNSC and both countries share common concerns and objectives in the field of non-proliferation of weapons of mass destruction.

Both have reiterated their support to the Indian Ocean Rim Association (IORA) and the values it promotes, and commitment to proactively contribute towards the priorities of IORA. China's mili-

tarisation of the Indian Ocean is cause of concern for both India and France, even as India is redefining its strategic space in the Indo-Pacific. Signing of the agreement for granting reciprocal access to facilities of both countries allows India logistics access to French military bases in Djibouti, Abu Dhabi, and Reunion Island, which will be important definite force multipliers. France has always maintained an independent policy including with the US and NATO. It will not like to join the 'Quad' comprising India, US, Japan and Australia. But notwithstanding that close bilateral Indo-French bilateral partnership is significant for both countries.

In the absence of a security architecture for the Indo-Pacific to ensure security of SLOCs, global commons and the region, interoperable navies that can use each other's naval facilities is certainly the best substitute. But this being just one part, the India-France strategic partnership has great potential to keep going from the next to next level. **SP**

During President Macron's visit, India and France inked 14 key agreements in strategic areas of security, nuclear energy, and protection of classified information, while companies from both countries signed contracts worth \$16 billion



LT GENERAL
P.C. KATOCH (RETD)

The Chinese challenge

Post being anointed President for life, Xi Jinping told 3,000 legislators of the Chinese Parliament on March 20, 2018, “The Chinese people have been indomitable and persistent. We are resolved to fight the bloody battle against our enemies, and on the basis of independence we are determined to recapture the relics.” He did not identify China’s enemies but said China would not cede a single inch of its territory. That raises the question which territories Xi was talking about – all the illegal Chinese claims of which he himself has been party to? Some analysts feel the “bloody battle” part is directed towards Taiwan, capture of which will imply China battling the US. Since 2000, Indian delegations visiting China were told that China will integrate Taiwan into mainland China by 2025. It is possible Xi was referring to that.

But, what about other illegal Chinese claims, including India; Arunachal Pradesh, Eastern Ladakh and elsewhere? Besides, not only China has territorial disputes in the East China Sea (ESC) with Japan and South China Sea (SCS) with Vietnam, the Philippines, Malaysia, Brunei and Taiwan, she actually claims territories in 23 countries even though sharing borders with only 14. Overall, illegal claims of present day China itself. Many of these claims are based on unsubstantiated so-called historical claims dating back to centuries. But here too China cunningly chooses particular timeline in particular century to go back. For example, in the seventh century Tibet was an empire, spanning the high heartland and deserts of the north-west, reaching from the borders of Uzbekistan to Central China, from halfway across Xinjiang, an area larger than the Chinese heartland. In 763, Tibetan army briefly captured the Chinese capital Chang-an (today’s Xian and much later it was the Mongols who later ruled China then occupied Tibet. So should Mongolia claim Tibet?

Getting back to Xi, he said, “We have strong capabilities of taking our due place in the world. We have fought for that big dream for about 170 years. Today more than ever the Chinese people are close to that dream, ever more confident and capable of realizing the rejuvenation of the Chinese nation.” All told, typical call by a modern-day Hitler announcing the use of force.

China has been sending mixed signals to India. In December 2017 China’s Special Representative Yang Jiechi delivered President Xi Jinping message to Prime Minister Modi that both countries should aspire to become “friends for generations” and “partners in rejuvenation”. But simultaneously PLA was permanently establishing in North Doklam. Yang Jiechi was also State Councilor under Premier Li Keqiang in 2013 when latter visited India in wake of 19 km deep intrusion at Raki Nala in Dopsang Plains of Eastern Ladakh. Next, Chinese Foreign Minister Wang Yi telling media in Beijing in March 2018, “Despite some tests and difficulties, the China-India relationship continues to grow. ...China is upholding its rights and legitimate interests and taking care to preserve the relationship with India... Chinese dragon and Indian elephant must

not fight each other but dance with each other..... If China and India are united, one plus one will become eleven instead of two. With political trust, not even the Himalayas can stop us from friendly exchanges”. But Wang Yi’s call for tango also raises many questions. Dance to whose tune – China’s? Doesn’t his statement about upholding China’s rights and legitimate interests imply all illegal claims (Doklam, Arunachal Pradesh, other areas) and isn’t this a threat? What is the basis of trusting China – a call to Tango? Where was China when Russian President was pushing for stronger India-China-Russian relations decade plus back? The Indian response was quite erratic.

A government memo asked senior leaders and government functionaries not to attend Tibetan diaspora events to mark 60 years of Dalai Lama’s exile and thank India for giving Tibetans shelter. With Tibetan Prime Minister Lobsang Sangay invited for Modi’s swearing-in, would it not have been prudent to quietly orchestrate postponing ‘thank you’ event to end 2018, giving time to observe Chinese behaviour? India also cancelled the annual Asian Security Conference to be hosted this month by the Institute of Defence Studies and Analysis (IDSA) citing “administrative reasons”, this year’s theme being “India and China in Asia: Making of a New Equilibrium”. Whether there was fear or not of statements during the event could displease Chinese participants, it does indicate undue appeasement – a sign of weakness.

Sure, With External Affairs Minister Sushma Swaraj is attending the Foreign Ministers meet in China ahead of the SCO summit in Qingdao in June 2018 which will be attended by Prime Minister Modi, but Chinese signals need to be read with caution. Recent news have appeared that PLA is building yet another road in Doklam leading to the Jhamperi ridge occupied by India. In March 2018, Chinese boats carrying arms entered Bangladesh waters and arms were smuggled into the country allegedly for local extremist groups and insurgent outfits in northeast India. While Bangladesh military officials and Coast Guard are under scanner, it is quite likely that China is assisting overthrow of the Bangladesh Government and perhaps assassination of Sheikh Hasina.

That China has been arming and supporting insurgents in India northeast as also Maoists is well known. In 2015, China established the United Liberation of West, South and East Asia combining nine militant groups including the NSCN (K) and ULFA. All these are the real face of China who has also been using Pakistan against India, employing ancient strategy to ‘Kill with Borrowed Knife’. India must remain steadfast even though China will likely to go for intrusions along the LAC, especially in Arunachal Pradesh, in order to pressure India to join the CPEC, which India should not because that would imply surrendering sovereignty like Pakistan. At the same time, if we want peace, we must prepare for war. In geopolitics, no negotiations work from position of weakness. **SP**

The views expressed herein are the personal views of the author.



Independence Day bonhomie between Indian and Chinese Border Troops in Eastern Ladakh

Can India afford to 'chill-out' about China?

With a trade corridor that flouts India's sovereignty in full swing and wounds of Doklam still fresh, former Army Chief General V.P. Malik and former Air Chief Marshal Fali Homi Major interpret the Sino advances on Indo turf

[By **Arpita Kala**]

The recent violation of Indian airspace by China isn't a first nor does it seem to be the last. A 73-day military face off at Doklam last year at the behest of Bhutan that involved soldiers from the two sides throwing punches and stones at each other, and the frequent appearances of Chinese attack submarines in the Indian Ocean has got the nation on its tenterhooks.

With the recent military budget allocation being the lowest since 1962 (also the year of Sino-Indian war, an ominous date indeed), many are concerned if we can afford to 'chill-out' about China?

Hope Springs Eternal

"No, we can't afford to 'chill out' but we shouldn't put China on a pedestal. It's not 12 ft tall and I think given the capabilities of our armed forces coupled with good diplomacy, China doesn't seem to be a problem to me," says former Air Chief Marshal Fali Homi Major.



"I am definitely not asking for a war or any sort of war mongering but if the situation is likely to escalate, we need to be prepared for it," says former Army Chief General V.P. Malik

"These are just nuances of diplomacy. Like I know that the Prime Minister is supposed to go to SCO summit, then our defence minister and even foreign minister will be visiting China. So, there are a number of events coming up in the next few months where there will be exchanges at a very senior level and probably that's the reason why the Ministry of External Affairs (MEA) doesn't want to create a situation which can fizzle out the major changes that can take place. I wouldn't like to pass any judgment but if the Ministry of External Affairs has passed these instructions, it must be for a valid reason," reasons General Ved Prakash Malik, who also served as Army Chief during the Kargil War.

Crouching Tiger, Not-So-Hidden Dragon

However, China's advances cannot be taken lightly either. Former Army Chief General Ved Prakash Malik agrees. He says, "China has started asserting itself militarily on all its fronts whether it is South China Sea or unresolved Indo-Tibet and Indo-China borders. What's worrisome is that whatever they think belongs to them, they are becoming more and more assertive about it. They may not want to start a war at these places but inching forward is what we have seen along our borders. So, with their aggressive patrolling, trying to inch forward, we have to be really alert around the borders."

Not only militarily, but economically too China is making no bones about irking India. Its ambitious Belt and Road Initiative (BRI) that seeks to rebuild the China's old Silk Road trade routes bypasses India, apart from a corner of the disputed Pakistan occupied Kashmir (PoK) region but involves the neighbouring Sri

Lanka, Nepal and the Maldives, with the exception of Bhutan. India's bone of contention is not as much the cold shoulder from the initiative but the fact that it passes through the PoK and even boycotted last year's Belt and Road Forum organised by China. The MEA also issued a statement on its objections on mainly three grounds— the corridor includes projects in lands belonging to India, the initiative risks running smaller countries into huge debts and could destroy the ecology as well as disrupt local communities.

On that note, the annual India-China military exercise will also resume this year after being shelved due to tensions last year. India is also being extra cautious to appease the dragon vis-à-vis Tibet. Recently senior government officials were instructed not to attend the "Thank You India" event organised by the Tibetan government-in-exile marking 60 years of political asylum in India. Reportedly, the Tibetan spiritual and religious leader, His Holiness Dalai Lama also cancelled an upcoming visit to the Indian border state of Sikkim — a region that China claims is part of Tibet, lest it offended China. While many officials maintain that Indo-Tibet relationship is 'very little political but more spiritual, religious and cultural', the Prime Minister's upcoming China visit may be the reason behind the move.

Lanka, Nepal and the Maldives, with the exception of Bhutan. India's bone of contention is not as much the cold shoulder from the initiative but the fact that it passes through the PoK and even boycotted last year's Belt and Road Forum organised by China. The MEA also issued a statement on its objections on mainly three grounds— the corridor includes projects in lands belonging to India, the initiative risks running smaller countries into huge debts and could destroy the ecology as well as disrupt local communities.

However, in spite of apprehensions, government attendees at the upcoming SCO meet are expected to tactically refrain from opposing BRI as well as the China-Pakistan Economic Corridor (CPEC).

Budget Trouble

Despite General Bipin Rawat's reassurances, the fact remains that the defence budget is inadequate to counter hostile neighbouring countries. Minister of State for Defence Subhash Bhamre also mentioned the same in a written reply that the current budgetary allocation was around ₹76,765 crore less than what the forces sought.

General V.P. Malik says, "Any serving army chief has to say things like this. Even during Kargil war when we had lots of deficiencies, I had also said that we will fight with what we have. So, you cannot wrong him (General Rawat) on that. The fact is that today we know that there are a large number of deficiencies and our modernisation has been lacking. These indications were given by Vice Chief Lt General Sarath Chand...even minister Subhash Bhamre has spoken about the same in a letter. The point is that we are weak today on two major issues—the infrastructure, particularly around the northern borders and secondly, deficiencies and lack of modernisation. Both these things require money and therefore a large number of us feel that the budget is inadequate."

According to General Malik, the budget may hit the government's ambitious 'Make in India' project too with the lack of capital not attracting enough companies. He also suggests that the army, navy and air force also amp up their savings to be used for modernisation. He says, "I am definitely not asking for a war or any sort of war mongering but if the situation is likely to escalate, we need to be prepared for it. When we are looking to 'Make in India', the private or any other sector wants to see how much capital do we have. If we don't have that what kind of orders can they expect from the Ministry of Defence? So, it is essential, I believe to give them more money as well as save money within the Armed Forces, all three forces, to the extent that it's possible. And, that saving should also go into the modernisation kitty, not anywhere else." SP



"We shouldn't put China on a pedestal. It's not 12 ft tall and I think given the capabilities of our armed forces coupled with good diplomacy, China doesn't seem to a problem to me," says former Air Chief Marshal Fali Homi Major



AIR MARSHAL
B.K. PANDEY (RETD)

After the confrontation in Doklam

Despite the humiliating defeat in 1962 of the Indian Army at the hands of the People's Liberation Army, the focus thereafter of not only the Indian Army but also of the Indian Air Force (IAF), remained concentrated on the Indo-Pakistan border. The perpetual conflict over Jammu and Kashmir and its potential to escalate into a full-scale war with Pakistan, were possibly the primary reasons why the nation adopted Pakistan-centric policy for the deployment of its armed forces.

For a variety of reasons including possibly the lack of adequate operational capability, the IAF was kept out of the Sino-Indian conflict of 1962 leaving the Indian Army to face the onslaught of the Chinese ground forces. But after years of diffidence and neglect of the Sino-Indian border, the situation has indeed begun to change and over the last decade or so, the Indian Army and the IAF have taken a number of measures to bring about positive changes. While the Indian Army has bolstered its strength considerably to take on the PLA and is now better placed in respect of infrastructure development especially by way of road network that will help provide far better logistic support, the IAF too has taken a number of steps to enhance both defensive and offensive capability against the Chinese armed forces deployed against the frontiers of India in the North East Region. The recent confrontation with China at the Doklam Plateau in Bhutan wherein Indian and Chinese forces were locked in a 73-day stand-off that began on June 16 last year and ended on August 28 the same year, was a grim reminder that there is no room for complacency on the part of the Indian armed forces on the Sino-Indian border.

While the most potent platforms in the combat fleet of the IAF were invariably based at airfields on the Western front, those in the North East region generally housed the older and less capable combat platforms and logistic support platforms both fixed and rotary wing platforms. In 2008, the Ministry of Defence took a decision to station the Su-30 MKI multi-role air dominance fighter aircraft at the four major air bases in North East India that were located in the proximity of the Sino-Indian border. These four airfields were at Tezpur, Chabua, Hashimara and Bagdogra. In addition, the IAF has been able to upgrade and fully operationalise seven Advanced Landing Grounds (ALGs) in Arunachal Pradesh. These ALGs that were short, unprepared or semi-prepared landing ground or even mere grass strips that could accommodate only light or at best medium-lift transport aircraft deployed to provide logistic support to forces deployed on the North Eastern front, can now host even the latest combat aircraft as also strategic airlift aircraft. The IAF is in the process of building blast pens to ensure safety of combat aircraft from attack by enemy aircraft when parked at these ALGs during a possible sino-Indian conflict in the future. The upgraded ALGs are located at Walong, Ziro,



Along, Mechuka, Pasighat, Tuting and Vijaynagar. This has been a major forward movement in the regime of infrastructure development which will undoubtedly enhance the country's operational reach and capability.

In August 2016, a Sukhoi Su-30 MKI combat aircraft of the IAF landed at the upgraded ALG at Pasighat in Arunachal Pradesh on the occasion of its formal commissioning for operational use. On March 14 this year, the IAF landed the C-17 Globemaster III, the largest strategic airlift transport aircraft on the inventory of the IAF, at the upgraded Tuting airfield in Arunachal Pradesh which is located in the proximity of close to the Chinese border. This has certainly strengthened the IAF's operational capability in the North East region.

Air operations capability is also being strengthened along the border with China in Eastern Ladakh. Earlier on, in August 2013, the IAF carried out a landing by a C-130J Super Hercules tactical airlift aircraft at the rudimentary airstrip in Daulat Beg Oldi (DBO) in Ladakh, just seven km from the border with China. Located at an altitude of nearly 17,000 feet above sea level, DBO is the highest ALG in the world and overlooks the strategic Karakoram Pass.

While both the Indian Army and the IAF have taken a number of concrete steps, the IAF plans to operate Su-30 MKIs capable of carrying the BrahMos supersonic cruise missile. The IAF has plans to base the first squadron of the Rafale fighter jet at Hashimara by 2020. This aircraft procured from Dassault Aviation of France is capable of delivering nuclear weapons. The Indian armed forces have indeed come a long way since the debacle of 1962. **SP**

The views expressed herein are the personal views of the author.

Defence Minister urges defence PSUs & ordnance factories to be more dynamic

Private Sector being given full play in achieving self-reliance in defence production

[By Special Correspondent]

Defence Minister Nirmala Sitharaman, has underlined the need for revitalising defence PSUs and ordnance factories for meeting the ammunition needs of India's defence forces. "The managements of these organisations need to be ahead of the curve and show dynamism," as they possess immense and valuable assets that could offer manufacturers huge production opportunities, she said.

The Defence Minister was addressing Ammo India 2018, the 1st International Conference on Military Ammunition on the theme, Make in India - Opportunities and Challenges, organised by FICCI and the Centre for Joint Warfare Studies (CENJOWS) under the Ministry of Defence on March 12, 2018.

The government has opened up private investment in defence production, including liberalisation of foreign direct investment. It has initiated steps to develop two defence industrial production corridors in the country and also proposes to bring out an industry-friendly Defence Production Policy 2018 to promote domestic production by public sector, the private sector and MSMEs.

The Defence Minister said that the government expects wholehearted participation of Indian industry and foreign OEMs to leverage the indigenous capability and opportunities for self-reliance in defence production. She said that Defence Ministry was encouraged by the quantum of outsourced component in defence manufacturing which had risen to 29 per cent in fiscal 2016-17. This, she said, displayed that Tier-I Indian companies were up to their task and also serve as an assurance to SMEs that their products would be sourced by big companies.

The Minister said that it was in this context that the announcement was made in the 2018-19 Budget that two defence industrial production corridors would be established. The one between Chennai and Bengaluru via a stretch of ordnance factories was coming up well and it was encouraging that SMEs had started to bring in start-ups to produce for the armed forces. Coordination between the DIPP and the Home Ministry was being actively pursued and this should give comfort to OEMs that different arms of the government were engaged in a well-oiled effort. The government was also actively working on the second corridor between Aligarh-Agra-Jhansi-Chitrakoot-Kanpur-Lucknow, she said.

She also said that under the 'Make II' initiative, procedure had been simplified and once a prototype was developed and tried out, manufacturers should not worry about orders as these would be forthcoming. The Defence Minister also released a FICCI-CENJOWS knowledge paper on 'Ammunition Manufacturing in India: Road to Self-reliance'.

Lt General, Giri Raj Singh, SM, Director General Ordnance Services, Indian Army, in his address, pointed out that under one of the largest procurement initiatives in arms and ammunition launched by the Defence Ministry, RFPs for eight projects were released for procurement of medium and large calibre ammunition for the Industry private sector. These projects entail an expenditure of

₹70,000 crore in 10 years. The final corrigendum, incorporating the amendments, to the RFPs would be out in the next one month. He said that the vision was complete self-reliance in armament manufacturing and the government's 'Make in India' programme has paved the way for making the vision a reality.

Rashesh Shah, President, FICCI, called for fast-tracking the clearances of licences for production by the private industry, easing of restrictions on the number of contracts a company could bid for and reduction in the requirement of high earnest money for procurement orders. He also underlined the need for creating a level-playing field for all players to speed up indigenous defence manufacturing.

Lt General Vinod Bhatia PVSM, AVSM, SM (Retd), Director, CENJOWS, in his concluding remarks at the inaugural session said that Ammo India provided a common platform to industry players to share their concerns on national security to facilitate the preparation and presentation of a pragmatic roadmap for defence production to the government.

Secretary General, FICCI, Dr Sanjaya Baru assured the Defence Minister that FICCI is ready to extend all support to the government in the organisation of the upcoming Defexpo.

FICCI-CENJOWS Knowledge Paper

The FICCI-CENJOWS knowledge paper makes several recommendations to the Ministry of Defence and private industry to attain the objective of self-reliance. These include:

Reduce procurement lead times: Multiple RFIs and RFPs have been issued in the past with no result in the arms and ammunition category.

RFP must outline complete roadmap: It would not suffice to simply issue RFPs exclusive to private industry. Complete roadmap for an ammunition RFP should be outlined, one with hand-holding and guidance to the private industry from the Government of India, (including agencies like the DGQA, the end user and DRDO).

Long-term covenant: This should be part of any proposal for ammunition manufacturing, once you place an order on a company then for next 10 years they would be the source for that product (in order to get ROI on infrastructure investment).

Industrial licensing process should be streamlined: DIPP has an online process now but MHA (which issues licence for small arms and ammunition) is an offline process; Documents required need to be clearly stated, since the documents stated on the site and forms do not seem to suffice.

Establish an Ombudsman for Industrial Licence: Regular feedback mechanism and intimation to the industry on details lacking in their application and well as status.

The paper notes that lack of design and R&D within the private sector, still leaves us dependent on foreign OEMs for transfer of technology. Notwithstanding the fact that this sector was not open to the private industry, there needs to be more than just intent from the companies to fructify arms and ammunition manufacturing and address the needs of the Armed Forces. **SP**

Defence Minister initiates development of Tamil Nadu defence corridor at defence industry meet

Under the Prime Minister Narendra Modi's larger vision of pushing 'Make in India', the Ministry of Defence has taken multiple measures to promote indigenisation in the defence industry. In the 2018 budget, two Defence Corridors were announced in Tamil Nadu and Uttar Pradesh. Subsequent to the announcement, the process has begun to set up these corridors.

As one of the first steps to initiate development of the Tamil Nadu Defence Corridor, an interactive meeting with local industry was held at Tiruchirappalli, on March 16. The meeting, which was attended by over 200 representatives from the industry, was addressed by Defence Minister Nirmala Sitharaman. Several ministers and senior officials of Tamil Nadu Government and senior officials from Ministry of Defence, Defence Public Sector Undertakings, Bharat Heavy Electricals Limited (BHEL) and Ordnance Factory Board were also present in the meeting. In her inaugural address, the Minister gave a brief overview of the importance of the defence sector in the overall growth and development of the country and highlighted



the importance of the proposed Defence Corridor in this respect. She sought the active support of all the stakeholders to make the project successful. Sitharaman also invited the local manufacturers to showcase their products related to defence supplies so as to attract the attention of more than 300 manufacturers expected to be present in the Defexpo 2018, scheduled between April 11-14, 2018, in Chennai.

Several presentations ranging from measures taken to promote indigenisation and self-reliance in defence production, the industry friendly measures taken by the Tamil Nadu government, the envisaged role of the public sector enterprises in the proposed Defence Corridor and the capabilities and expectations of the local industry were made. The presentations were followed by a very vibrant question answer session.

The Tamil Nadu Defence Corridor, also called the Tamil Nadu Defence Production Quad as the nodal cities form a quadrilateral, will include Chennai, Hosur, Salem and Coimbatore, Tiruchirappalli as nodes. These nodal cities have existing defence ecosystem in the form of OFBs, vendors working with Defence PSUs, and other allied industries. The Tamil Nadu Defence Corridor aims to bolster interaction between all industry players in order to create long-term synergy and eventual development of the area into a Defence Production powerhouse. **SP**

Dr Subhash Bhamre inaugurates new building Of NIDEM

Minister of State for Defence Dr Subhash Bhamre recently inaugurated the new building of National Institute of Defence Estates Management (NIDEM) in Delhi. The training institute of Indian Defence Estates Service (IDES) has come a long way since its humble beginning at Meerut in 1982. Speaking on the occasion Dr Bhamre said the day marks fulfilment of a dream of having a full-fledged set-up for imparting training to the new recruits as well as updating the in-service officers in modern technologies in management of valuable defence land and administration of Cantonments.



He said the IDES Cadre is critical in overall scheme of management of Defence Land. Proper Cadre management keeps the officers motivated to scale new heights and proper training gives the officers and staff, all the required skills to discharge their duties efficiently, effectively and ethically. Dr Bhamre lauded the efforts of NIDEM in imparting training to in-Service officers of the defence forces and it will now be convenient to organise training programs for the officers of the Services more frequently.

Sharing his experience of the last 21 months, Dr Bhamre said, "The organisation has done well in the ambitious projects of survey of entire Defence Land and digitisation of valuable land records through latest techniques. I extend my compliments to DGDE and his team." He advised that issues like renewals of leases, mutation of properties in Cantonments and processing of acquisition proposals should be worked out within prescribed time limits.

The institute started in 1982 from a small accommodation shared by National Institute of Management & Accounts (NIMA) - a training institute of IDAS (Indian Defence Accounts Service) officers. It was shifted to Delhi in 1995. It was initially located in the office of Defence Estates Officer, Delhi Circle, thereafter in the premises of Raksha Sampada Bhawan. In both these places, the training infrastructure was inadequate. The Institute basically trains the officers of Defence Estates Organization in civic administration and land transfer matters. With the rapid changes in the field of urbanisation and e-governance, NIDEM has developed expertise in training officers in the fields of solid waste management, RTI, Public Private Partnership, developmental planning, public health, the gender issues etc. Besides training the officers and staff of Defence Estates Organization, NIDEM also trains the officers of the wings of Defence services on land related issues and Cantonment matters.

Director General Defence Estates Shri Jojneshwar Sharma informed that there were 62 cantonments in 19 States with an area cover of 1,86,730 acres. Cantonment Boards are responsible for providing civic administration and implementing the Central Govt schemes of social welfare, public health, education, hygiene, safety, water supply, sanitation, urban renewal etc in the Cantonment areas. **SP**

Just a crore of FDI in defence

At a time when India is making efforts to reduce its defence import bill and develop defence manufacturing through 'Make in India' initiative, the Foreign Direct Investment (FDI) figures shared by the government shows little interest of the world in Indian defence sector.

According to the government's figure given in the Parliament, India received FDI of around \$0.18 million "in defence industry sector from April 2014 to December 2017." Going by the current conversion rate, this amount comes to Rs 1.17 crore.

This information was given by Minister of State for Defence Dr Subhash Bhamre in a written reply in Lok Sabha on March 7, 2018.

In 2016, India revised its FDI policy on various sectors including defence. In the new policy, FDI up to 49 per cent "is under automatic route and beyond 49 per cent is through government route wherever it is likely to result in access to modern technology or for other reasons to be recorded."

Last year, Government informed Parliament, "In the year 2014-15, FDI of \$0.77 lakh and \$0.01 lakh has been received from France and Israel respectively. In the year 2015-16, FDI of \$0.95 lakh has been received from France. In the year 2016-17, FDI of \$0.01 lakh has been received from Israel."

These figures clearly show that the foreign investors are not interested in making direct investment in Indian companies.



Instead of investment, foreign players tend to form joint ventures with Indian private and public sector for participation in defence contracts where if selected Indian companies would establish factories and foreign partner would support through technology transfer for manufacturing of goods in India.

In last few years, global majors have started fully owned Indian subsidiary, which does not require much FDI. **SP**

—Rohit Srivastava

Rear Admiral Puneet Chadha, VSM assumes office as the Deputy Commandant, Indian Naval Academy

Rear Admiral Puneet Chadha, VSM took over charge as the Deputy Commandant of Indian Naval Academy (INA), Ezhimala, on Tuesday, March 27, 2018.

Rear Admiral Puneet Chadha, VSM, is a specialist in Anti Submarine Warfare (ASW) and a Graduate of National Defence Academy, Khadakvasla and Malaysian Armed Force Staff College, Kuala Lumpur. He is a post graduate in Strategic and Defence Studies from University of Malaya, Kuala Lumpur and M.Phil from Madras University.



In his illustrious career spanning 30 years, he commanded four frontline warship which include aircraft carrier INS Viraat, Rajput Class Destroyer INS Ranjit, Submarine rescue warship INS Nireekshak and Missile Corvette INS Vibhuti.

He has also held various prestigious staff and operational appointments including Fleet Operation Officer of the Eastern Fleet based at Visakhapatnam, Director Prespective Planning at Indian Army Headquarters, Director Net Assessment at Headquarters Integrated Defence Staff (HQ IDS) and was the Director and Principal Director Staff Requirements at Integrated Headquarters Ministry of Defence (Navy). He has also done instructional appointments as Directing Staff at Centre for Leadership and Behavioral Studies (CLABS) Kochi and at Defence Service Staff College, Wellington, Nilgiris, Tamil Nadu.

The officer was promoted to the rank of Rear Admiral on March 27, 2018, and took over as the fifth Deputy Commandant of Indian Naval Academy, Ezhimala. The officer is a recipient of Vishisht Seva Medal (VSM) for his distinguished service of an exceptional order to the nation. **SP**

Successful test firing of Brahmos with indigenous seeker

BrahMos, the formidable supersonic cruise missile with indigenous seeker was successfully flight tested at 0842 hrs on March 22 at the Pokhran test range in Rajasthan. The supersonic cruise missile and the seeker have been developed jointly by DRDO and BrahMos Aerospace.

The precision strike weapon with indigenous seeker flew in its designated trajectory and hit the pre-set target. The flight test was conducted by the scientists of DRDO and BrahMos along with

the Indian Army. A high level team led by Chairman DRDO & Secretary DDR&D Dr S. Christopher was present during the flight trial, which included DG (Missiles & Strategic Systems) & SA to RM Dr G. Satheesh Reddy and Director General BrahMos Dr Sudhir Mishra.

Programme Director Dr Dashrath Ram and Project Director Mrs V Prameelawho had led the effort for development of the indigenous seeker were also part of the team. Senior IAF officials also witnessed the successful launch of the tactical weapon. **SP**





LT GENERAL
P.C. KATOCH (RETD)

Coming – Chinese robot tanks

In October 2017, media reports confirmed the government seven-point strategy as prelude to India's strategic plan for using AI (artificial intelligence), covering issues like developing methods for human machine interactions, ensuring security of AI systems, creating competent workforce matching AI and R&D needs, addressing ethical, legal and societal implications of AI, measuring and evaluating AI technologies through standards and benchmarks, and the like. An experts committee has also been set up in the Ministry of Electronics and IT to advise the government on a policy for AI, government's main focus is to reduce cyber attacks with AI. The main central policy is to be drawn once the experts committee submits its report.

Machine intelligence-powered platforms sure can become a strategic instrument of governance in India across a wide range of public services, from NATGRID to Aadhaar but the defence sector needs much more focus. DRDO's Centre for Artificial Intelligence & Robotics (CAIR) has developed a range of robots with varied applications, and is also developing: man portable unmanned ground vehicle (UGV) for low intensity conflicts and surveillance in urban scenario; wall climbing and flapping wing robot; walking robot with four and six legs for logistics support; Network Traffic Analysis (NETRA) which can monitor internet traffic.

But considering the pace at which developments are taking place, particularly in China in combining robotics and AI, our slow progress in this field is liable to leave us at huge asymmetric disadvantage. News about cooperation with Japan on AI is good but looking at the abysmal FDI in the defence sector and the floundering 'Make in India' initiative because of the rot within Ministry of Defence, as pointed out by Dr Subhas Bhamre, MoS (Defence) to the Prime Minister recently, the prospects don't look good.

CCTV (China's TV channel) recently showed video footage of a Type 59 based tank being controlled by a soldier sitting in front of a computer terminal with a steering wheel. According to Russian sources, quoting Chinese media Sohu, the footage was made in the 'Unmanned Battle Systems Lab of PLA'. China's Type 59 is based on the Soviet T-54A tank, bought from Russia in 1950s, and the unmanned version may be armed with a 100mm or 105mm cannon. For present, this may just be a demonstrative model but with integration of remote target acquisition and remote fire control technologies, this would become cutting edge military weapon platform. Given the pace of Chinese R&D, such development would not be too distant. Sohu also reported that unmanned warships, drones and battle vehicles programs are also under development.

In 2017, China's State Council issued an ambitious policy blueprint calling for the nation to become "the world's primary AI innovation center" by 2030, by which time, it forecast, the country's AI industry could be worth \$150 billion. China is investing heavily in

all aspects of information technology, from quantum computing to chip design. Multiple initiatives have been launched including China building \$2.1 billion AI technology park in Beijing's western suburbs. Compare this with America's total spending on unclassified AI programs in 2016 of \$1.2 billion.

Nations are seeking to harness AI advances for surveillance and censorship, and for military purposes. According to Elsa Kania, fellow at the Center for a New American Security in Washington, DC notes in her recent study on China's military AI investments, that in fields of AI in China the boundaries between civilian and military research and development tend to become blurred, adding, "The PLA may leverage AI in unique and perhaps unexpected ways, likely less constrained by the legal and ethical concerns prominent in US thinking. China's military is funding the development of new AI-driven capabilities in battlefield decision-making and autonomous weaponry."

In 2014, PLA Major General Xi Hang, heading PLA's Academy of Armoured Forces Engineering had said, "Unmanned ground vehicles will play a very important role in future ground combat. Realizing that, we have begun to explore how to refit our armoured vehicles into unmanned ones." Robotic systems coupled with AI will be live threats on the battlefield sooner than we can think. Not only will China deploy such systems along the Line of Actual Control with India, there is every possibility of these moving into PoK and Pakistan as PLA deployment grows in the region. In addition, select technologies will be passed on to Pakistan and other strategic partners.

Gorden G Chang, author of 'The Coming Collapse of China', in his article 'The World Should Take China's War Threats Seriously' published in National Interest on March 23, 2018 writes that armed with second term, Xi Jinping is now full of fire and fury, and that when he promised "full unification of the motherland" to the National People's Congress on March 20, that is code for annexation of Taiwan, large portions of India, dozens of Japanese islands, a speck of South Korea, Philippine rocks and reefs, and almost all the waters of the South China Sea. Obviously, Gordon doesn't imply this happening overnight but in sharp contrast the mood in India appears to be that conflict is not on the cards at all because of the downturn of Chinese economy and Sino-Indian trade relations. China has excellent trade relations with Taiwan and China also but gives no credence to economic relations when it comes to territorial claims – however illegal. It is for good reason that China has enhanced deployments and communications in Tibet opposite India, consolidation the 'string of pearls' and invested in sub-conventional war on India. Any conflict, however small, would impact Indian economy adversely. We need to seriously prepare for conflict that would likely see use of robotics and AI.

Prudence demands that India should prepares for conflict that would likely combine robotics and AI; unmanned ground vehicles, drone swarms, quantum communications, cyber attacks and more. **SP**



Airbus A330 MRTT

IAF's quest for flight refuelling aircraft

While the process for selection of a new FRA is underway, there is trepidation amongst IAF circles about the budgetary deprivation the defence services are afflicted with

[By **Group Captain A.K. Sachdev (Retd)**]

Experimentation in air-to-air refueling commenced in 1920s. Considering that the first flight itself took place in 1903, the lure of air-to-air refueling appears to have manifested itself rather early, long before the term 'force multiplier' appeared with its multi-faceted connotations in the military context. Today, air-to-air refueling is used by those nations that can afford it. Its advantages are truly force multiplying: the range and endurance of aerial platforms can be increased considerably, combat aircraft can enhance their combat staying power or reach targets beyond their normal radius of action and, in case of hot-and-high airfield operation, where their weapon payload is otherwise restricted, still carry a full payload at the cost of equivalent fuel weight which is then recompensed through air-to-air refueling. In addition, air-to-air refuelling enables scarce combat aircraft to be moved from one theatre to another rapidly. The Indian flirtation with air-to-air refueling is around a decade and a half old, but its experi-

ence has been less than happy. This article takes a brief look at the past and then examines the current initiative to acquire new tankers.

Inadequate Flight Refuelling Capability

India signed up for six Ilyushin IL-78MKI flight refueling aircraft (FRA) from Uzbekistan in 2002. The Russian airframe, a variation of IL-76 with 1985 vintage avionics, with Israeli fuel transfer system was inducted into 78 Squadron of the Indian Air Force (IAF) in March 2003. The squadron was named Mid Air Refueling Squadron (MARS). This FRA, six of which are in current service, can refuel three jets simultaneously and, in one operation, can refuel 6-8 Su-30MKIs. It can also refuel the Jaguar and the Mirage 2000. This capability has been practiced extensively and demonstrated while moving for participation in international exercises. The latest aircraft to be refuelled by the IL-78 is the Netra Airborne Early Warning and Control (AEW&C) aircraft. When the IL-78 was procured, the projected serviceability figure was 70 per cent. However, the actual serviceability has been under 50 per cent. There have also



Boeing's KC-46A refueller

been problems of spares and maintenance, especially with the refuelling pods due to frequent failures, inadequate repair facilities and poor maintenance support from the original equipment manufacturer (OEM). A Comptroller and Auditor General (CAG) report of July 2017, found other issues with the IL-78. The short-fall of maintenance hangars was highlighted and so was the fact that while the aircraft requires a runway length of 11,480 feet to 15,022 feet to carry full fuel load, no effort had been made to make such runways although the IAF had identified ten airfields for the purpose. Possibly, the runway extension has been shelved due to the fact that the aircraft are due for a major overhaul in 2018-19, during which the engine is to be upgraded obviating the need for the longer runway. There is also the issue of shortage of hydrant refuelling systems to tank up the IL-78s quickly.

Efforts to Procure Additional FRA

Irked by the poor reliability and serviceability of the IL-78 and needing more than six FRAs to meet its requirements of a two-front war, the IAF started looking at a new procurement within three years of inducting the IL-78. The first Request for Proposal (RFP) was floated in 2006 and the Airbus A330 MRTT (Multi Role Tanker Transport) was the finalist, but in 2010, the RFP was cancelled reportedly because the Ministry of Finance expressed "reservations relating to the high cost". In 2010, another RFP was issued to which Russian Ilyushin, Ukrainian Antonov and European Airbus responded. In January 2013, once again the A330 MRTT was declared as the platform of choice. Incredibly, the process was terminated once again citing high cost.

In January 2018, the IAF initiated its third endeavour to augment its existing fleet of aerial

tankers through a Request for Information (RFI) for procuring "six FRAs along with its associated equipment for the IAF to meet air-to-air refuelling requirements." The requirement is for a twin-engine, two-man crew aircraft with at least 40 years of residual life. These requirements seem to be focussed on keeping fuel and maintenance costs low so as to prevent a third damp squib experience. However, as a result, the IL-78 being a four engine FRA, has been precluded from the competition despite an offer of six new generation IL-78M-90 tanker aircraft in addition to upgrading the six existing IL-78Ms to the dash-90 standard, new avionics, additional fuel capabilities and replacing the D-30 KP engines with new PS-90s. The offer also includes conversion of one or two IL-76 transport aircraft into FRA. The last date for responding to the RFI was March 30, 2018. It is expected that the RFP will include a 30 per cent Offset clause and consider a 30 year life-cycle cost (LCC) as a factor. The decision for a twin-engine FRA is cost-driven, but has lower operational reliability as a four-engine FRA could continue its mission with a single engine failure while a twin-engine one would have to abort mission.

Boeing Offers New Options

In the previous selection processes, the only contenders were the IL-78 and the A330 MRTT. With the IL-78 out of the reckoning, the A330 MRTT remains a formidable contender, but there are at least two other challengers. The first is the Boeing KC-46 Pegasus which did not participate in the previous selections as it was not ready. Indeed, it is still under development and is expected to enter service with US Air Force (USAF) only later this year. The KC-46A is based on Boeing 767-200 and Boeing is committed to building 179 for the USAF by 2027. It can also be reconfigured to cargo and aero-medical evacu-

In January 2018, the IAF initiated its third endeavour to augment its existing fleet of aerial tankers through a Request for Information for six FRAs for the IAF



IAF's Su-30 aircraft being refuelled by IL-78 refueller

ation roles and is equipped with armour in the cockpit for crew protection, Infra Red (IR) countermeasures to deceive missiles and electromagnetic pulse (EMP) hardening to operate in hostile environments. Japan is the first international customer for the KC-46A but, interestingly, South Korea, a close trade and strategic partner for US, has favoured the A330 MRTT over the KC-46A. The aircraft was first shown to IAF at Seattle in 2016 and its capabilities are known.

The other likely contender is Israel Aerospace Industries' Bedek Aviation Group with its Boeing 767-300ER multi-mission tanker transport (MMTT) with a modern glass cockpit, new engines, underwing hose-and-drogue refuelling pods and a boom customised for each customer. The aircraft can be reconfigured to carry 200 troops or 60 tonnes of cargo. Bedek claims that the cost will be 15-20 per cent lower than an alternative with matching performance and operational capabilities.

Last year, Airbus made a clever offer as a package deal for six A330 MRTT that included an air-to-air refueling kit for the 56 C295 aircraft that India is procuring from Airbus. The offer holds only mild interest as a C295 cannot refuel combat aircraft, but would be restricted to refuelling helicopters and some other slower aircraft. There is some lure in that offer as even the figure of 12 (six existing plus six new) FRAs would be inadequate to meeting the tasks of IAF and the Indian Navy. Even otherwise the A330 MRTT holds an edge over the KC-46A according to a report by Indian Defence Research Wing.

As can be seen, the A330 MRTT can fly 2,500 nautical miles farther and 7,651 feet higher than the Pegasus, besides holding other advantages. However, with its smaller size and because the Boeing 767 costs less than the A330 MRTT, the final tipping factor may well be the lower unit and life-cycle cost of the KC-46A. This is especially so as the previous two RFPs have floundered on financial rocks. Boeing is also highlighting the fact that KC-46A has better compatibility than A330 MRTT to refuel other Boeing developed platforms like C-17, P-8I, Chinook MH-47E and even Lockheed Martin C-130J already operated by IAF and Indian Navy.

The recent air-to-air refuelling of the Netra brought to notice another initiative by DRDO. The IAF has reportedly asked for the Airborne Warning and Control System (AWACS) aircraft being developed around an A330 platform since 2015 to have the additional role of FRA. The wisdom of such a design is debatable and the arguments for and against will probably be deliberated upon in the future. Possibly, such an aircraft will lead to suboptimal attainment of either role while meeting the urgently required numbers of both AWACS and FRA.

Hoping for the Best

While the process for selection of a new FRA is underway, there is trepidation amongst IAF circles about the budgetary deprivation the defence services are afflicted with. For 2018-19, the IAF had made a projection of ₹1,14,526 crore while the allocation is only to the tune of ₹65,891 crore. Indeed, the IAF has reportedly stated its inability to make even the tranche payments for purchases already committed prior to this financial year. Thus there will remain an interrogation mark over the actual acquisition even after the selection process comes to its expectedly long drawn span. As far back as 2012, Vice Chief of the Air Staff, Air Marshal D.C. Kumaria, had said that all combat aircraft of the IAF would have air-to-air refueling capability in future, clarifying that the decision applied to all current and future acquisitions, whether combat jets, transport aircraft, helicopters or other assets. Consummation of this lofty sentiment is predicated to a speedy culmination of the just launched selection process, hopefully this time concluding logically into an actual purchase of a minimum of six FRAs for the IAF. SP

HOW THEY COMPARE		
Technical Comparison	KC-46A Pegasus	A330 MRTT
Range	3850 nm	6350 nm
Max Cruise Altitude	35000 ft	42651 ft
Cruise Speed	470 knots	470 knots
Max Take-off Weight	188,241 kgs	233,000 kg
Fuel Capacity	16700 gal	25765 gal
Length Total	159.10 ft	209 ft

PHOTOGRAPH: IAF



LT GENERAL
P.C. KATOCH (RETD)

The fiasco of GSAT-6A

On March 29, 2018, Indian Space Research Organisation (ISRO) launched GSLV Mk-II (GSLV-F08); carrying the 2,140 kg communication GSAT-6A, it took off from Sriharikota and some 17 minutes later the three-stage rocket injected the satellite into a geosynchronous transfer orbit. This was the Geosynchronous Satellite Launch Vehicle's 12th flight and sixth with indigenous cryogenic upper stage. In coming days, ISRO scientists were to fire the onboard thrusters to manoeuvre it to a geostationary orbit at an altitude of 36,000 km from earth.

In this launch, ISRO used the high thrust indigenous cryogenic 'Vikas' engine that has increased thrust by 6 per cent, consequently enhancing the payload capacity by 50 per cent – 2.5 tonnes in this case. The second stage planned also had electromechanical actuation system replacing electro-hydraulic actuation to enhance reliability of the rocket. These improvements and more are to be incorporated into GSLV's future missions, including Chandrayaan-2 planned for October 2018. However, after the successful long duration firings, when the satellite was on course to normal operating configuration for the third and the final firing, scheduled for April 1, 2018, communication from the satellite was lost at 9.30 a.m. on March 31. This is definitely a major setback but ISRO is making efforts to re-establish the communication link. Only after the communication link is re-established with the satellite can it be placed in its intended orbit. This may be a difficult proposition even if it is a case of mechanical/technical failure. On the other hand, if it has been caused by sabotage, then the satellite may be considered lost.

The fact is that the space is fast becoming an ambiguous battleground. China's space lab may be out of control and hurtling towards earth, but not only has it lived its life, its point of impact on earth may be fixed by China, though proclaimed out of control. China would already have considerable space capabilities and R&D in space would have been accelerated after Tianjin Port was stuck by a space weapon in August 2015. With China fixated with limiting India's strategic space and curbing our economy, wouldn't she love to sabotage ISRO's satellite that would boost mobile communications in India, including of Indian Armed Forces? The underlying fact is that such possibility cannot be discounted.

Cause for the downing of an Indian Air Force (IAF) Sukhoi close to the LAC in May 2017 was suspected by foreign analysts as a cyber-attack by China. Possibly same was the reason for downing of a UAV during the Doklam standoff, so why not a satellite? GSAT-6A, similar to its predecessor GSAT-6, is a high power S-band communication satellite with a mission life of some 10 years. It has a six-metre wide antenna that is meant for S-band communication; three times broader than those generally in ISRO satellites, which will enable the satellite to provide mobile communication for the country through handheld ground terminals, whereas, smaller antenna in

other communication satellites require larger ground stations. This will also benefit Armed Forces in use of hand-held mobile terminals. GSAT-6A will complement GSAT-6, which has been providing satellite communication services since its launch on August 27, 2015. ISRO is preparing for three launch campaigns including PSLV-C41 carrying IRNSS-1I, to be launched shortly followed by GSLV Mk-III.

India has plenty catching up to do in terms of mobile internet speed and broadband speed around the world. India was ranked 109 out of 122 in the Speedtest Global Index in November 2017, as also 76 rank out of 133 countries in broadband speed. For this, ISRO is planning to launch heavy-duty communication satellites. GSAT-11 is planned to be launched in April-May this year, with the 5,725-kg satellite carrying 40 transponders in the Ku-band and Ka-band frequencies aimed at providing high bandwidth connectivity with up to 14 gigabit per second (Gbps) data transfer speed.

On June 5, 2017, ISRO had launched GSAT-19, which too carried Ka/Ku-band high throughput communication transponders. Simultaneous to GSAT-11 planned to be launched from the European spaceport in April-May, ISRO will launch GSAT-29 through GSLV Mk III rocket from Sriharikota. Thereafter, GSAT-20 is planned to be launched in 2019. All these satellites together will provide high bandwidth connectivity of up to 100 gigabit per second; provide high-speed internet connectivity in rural areas as well and help bridge the digital divide. These satellites use multiple spot beams through a special transponder operating on high frequency, which increases internet speed and connectivity; spot beam being a satellite signal specially concentrated in power to cover limited geographical area on the earth. The narrower the beam more is the power. Moreover, these satellites will reuse the beams several times in order to cover entire India. GSAT-19 uses 16 beams and is able to transfer data at the rate of 13 Gbps. GSAT-20 will use 40 beams. Each beam will have two polarisations, which will effectively make them 80 beams. This satellite will have data transfer rate of 60-70 Gbps.

Many may not know that ISRO is helping 125 government projects work effectively and efficiently by optimising space technology, mainly for social-welfare and development projects including MGNREGA, navigation system and land demarcation plans. ISRO has repeatedly proved to be one of the most efficient and dedicated organisation in the country with recurring achievements that have made India proud. If it has set its sight on making mobile internet speed and broadband speed in India world class, there is no reason it will not achieve it. This year is also launch of Chandrayaan-2 mission. In case GSAT-6A is required to be re-launched, Chandrayaan-2 may be delayed. But Indians will be looking forward to future ISRO missions. **SP**

The views expressed herein are the personal views of the author.

Award of President's standard to 51 squadron and President's colours to 230 signal unit at Air Force station Halwara

The President of India and Supreme Commander of the Armed Forces, Ram Nath Kovind awarded the President's Standard to 51 Squadron and President's Colours to 230 Signal Unit of the Indian Air Force in a ceremonial parade at Air Force Station Halwara on March 22, 2018, in acknowledgement of their meritorious service. The President's Standard was received by Group Captain Satish S. Pawar, Commanding Officer of 51 Squadron, and the President's Colours were received by Group Captain SK Tripathi, Station Commander of 230 Signal Unit. On this occasion, the President also released the first day cover of both the units.

The President's Standard and Colours are the highest honour bestowed on units of the armed forces in recognition of their invaluable contribution to the security of the nation during peace and hostilities. Apart from being the highest possible recognition to a unit coming from the Supreme Commander, they commemorate the hard work and contribution by the personnel of the unit, past and present, to keep the unit flag flying high. The motivation that they provide to the younger generation in keeping the high standards set by their predecessors ensures that the IAF's ethos of professionalism and service to the nation remain prime and unremitting.

The President was presented the Rashtriya Salute at the commencement of an impressive parade. The parade was followed by a mesmerizing performance by the Air Force Air Warriors Drill Team. The Air Warrior Drill Team is the first of its kind amongst all military and Para Military Forces in India, with their unique synchronised drill movements with rifles carrying live bayonets. Thereafter, the fighter might of the Indian Air Force was displayed in a scintillating aerial display, with enthralling formation aerobatics



ics by the Surya Kiran Aerobatic Team and a heart stopping low level aerobatics display by Sukhoi-30 fighter jet.

The President conveyed his happiness in bestowing the esteemed honour to these Air Force units. In his address, he recalled the glorious legacy of the Indian Armed Forces in protecting the unity, integrity and sovereignty of the country.

This is the second occasion when Shri Ram Nath Kovind has bestowed the President's Standard at an Air Force Station in Punjab. Earlier he had presented the Standards at Air Force Station Adampur in November 2017.

The event was attended by a resplendent gathering comprising of various civil and military dignitaries. Prominent among those present on the occasion included Punjab Governor V.P. Singh Badnore, Minister in Waiting Tripathi Rajinder Singh Bajwa, Chief of the Air Staff Air Chief Marshal Birender Singh Dhanoa PVSM, AVSM, YSM, VM, ADC and Air Marshal C. Harikumar PVSM, AVSM, VM, VSM, ADC Air Officer Commanding-in-Chief Western Air Command. **SP**

Air Marshal R.K.S. Shera takes over as Air Officer-in-Charge Maintenance at Air HQ

Air Marshal R.K.S. Shera AVSM VSM took over as Air Officer-in-Charge Maintenance of Indian Air Force on March 1, 2018. He was commissioned in the Aeronautical Engineering Electronics Branch of Indian Air Force on January 5, 1981. He is a post graduate from IIT Kanpur in Electrical Engineering. He has been trained in Russia on MiG-29 aircraft at the time of fleet induction in 1986. He is



an alumnus of prestigious National Defence College (NDC). The Air Officer is a Fellow of Institute of Engineers, Institute of Electronics and Telecommunication and Aeronautical Society of India, besides being member of Computer Society of India.

The Air Officer was Senior Maintenance Staff Officer at HQ Maintenance Command before taking over as Air Officer-in-Charge Maintenance at Air HQ. During his career of 37 years, the officer has held several important command and staff assignments that include Assistant Chief of Air Staff (Engg A), SMSO HQ WAC, Station Commander TETRA School, Director MiG-29 Weapon Cell at Air HQ, Chief of Aircraft Production at Base Repair Depot, Inspector in Directorate of Air Staff Inspection (DASI), Chief Engineering Officer of a Fighter Base and Instructor at Technical Training School, Botswana (Africa). He has rich experience in the field of maintenance of aircraft from 'O' to 'D' Level. For his distinguished ser-

vice, the Air Officer was awarded Ati Vishisht Seva Medal in 2014 and "Vishisht Seva Medal" in 1993 by the President of India. **SP**

India orders final Boeing C-17 for \$262 million

India has finalised its acquisition of the last available Boeing C-17A Globemaster III strategic airlifter.

On March 30, Boeing was awarded a \$262,000,000 not-to-exceed undefinitised contract action for one C-17 aircraft. This contract provides for delivery of a C-17 aircraft in the India unique configuration.

Work will be performed in San Antonio, Texas, and is expected to be complete by August 22, 2019.

This contract involves foreign military sales to India. This award is the result of a sole-source acquisition. Foreign military sales funds in the amount of \$2,000,000 are being obligated at the time of award. **SP**

Saudi Arabian Military Industries and Boeing form JV partnership targeting 55 per cent localisation

In line with Saudi Arabia's Vision 2030 and following the announcement of Prince Mohammed bin Salman bin Abdulaziz, Crown Prince, Deputy Chairman of the Council of Ministers and Minister of Defense, to localise 50 per cent of the total military spending by 2030, Saudi Arabian Military Industries (SAMI) and Boeing recently signed a Memorandum of Agreement (MoA) to develop a new joint venture (JV) aiming to localise more than 55 per cent of the MRO services for fixed and rotary-wing military aircraft in Saudi Arabia. The agreement will also transfer technology to install weaponry on these aircraft as well as localise the supply chain for spare parts in the Kingdom.

The signing ceremony came in conjunction with Prince Mohammed bin Salman's visit to Seattle, which included an official visit and tour of Boeing's aircraft manufacturing facilities. The agreement was signed by Ahmed Al-Khateeb, Chairman of SAMI, and Dennis Muilenburg, Chairman, President, and CEO of Boeing, at Boeing's commercial manufacturing facility in Everett, Wash.

The JV agreement will provide sustainment services for fixed- and rotary-wing military aircraft of the KSA military fleet and will be the sole provider of these services for all military aviation platforms of the KSA military fleet, strengthening the Kingdom's defense capabilities and enhancing its deterrent potential.

"We deeply appreciate the trust that the Kingdom of Saudi Arabia in general, and HRH Prince Mohammed bin Salman personally, are placing in Boeing to help deliver Vision 2030 with this new joint venture," said Dennis Muilenburg, Boeing Chairman, President, and CEO. "Our relationship with the Kingdom dates back more than 70 years, and we look forward to continuing our successful partnership in support of the Kingdom's national security and aerospace industry needs."

The agreement will create 6,000 jobs and training opportunities for Saudi youth, support local content, improve Saudization levels in the industry, and assist towards achieving the ambitious Vision 2030 plan. **SP**

Rear Admiral Anil Kumar Saxena new Director Mazagaon Dock

Rear Admiral Anil Kumar Saxena, NM (Retd) has taken over as Director (Shipbuilding) of Mazagaon Dock Shipbuilders Ltd, Mumbai with effect from March 21, 2018. Prior to this he was Director General (Naval Design), Naval HQ, New Delhi.

Rear Admiral Saxena is a graduate in Mechanical Engineering from Nagpur University (VNIT, Nagpur) and a Post Graduate in Naval Construction from IIT, Delhi. He has also completed MSc in Ship Design from Kuznetsov Naval Academy, St Petersburg, Russia.

Commissioned into Indian Navy on August 21, 1982, he has held several important assignments including Principal Director (Naval Design), Naval HQ, New Delhi; Warship Production Superintendent, Mumbai; and Manager, Naval Dockyard, Mumbai. **SP**



HAL achieves all time high turnover of over ₹18,000 crore

The Government owned Hindustan Aeronautics Limited recorded a turnover of over ₹18,000 crore (provisional and unaudited) for the year ending March 31, 2018, (corresponding figure for the previous year was ₹17,605 crore). The Company expects continued "Excellent" MoU rating for the FY 2017-18 from Government of India on meeting all the relevant parameters related to its performance.

During the FY 2017-18, HAL produced 40 new aircraft/heli-

copters and 105 new engines. HAL also carried out overhaul of 220 aircraft/helicopters and 550 engines. The Company also received order of 41 Advanced Light Helicopters and 8 Chetak helicopters from Indian Armed Forces in the FY 2017-18. In the other major achievements, the Company received Initial Operational Clearance (IOC) certificate for its Light Combat Helicopter (LCH), Certificate of Airworthiness for its civil variant Dornier Do-228 from DGCA, acceptance of Mirage 2000 upgrade by Air HQ after its Final Operational Clearance, first successful run of Hindustan Turbo Shaft Engine-1200 and successful test firing of BrahMos missile from Su-30 MKI, etc.

Chairman and Managing Director of HAL, T. Suvarna Raju, said: "The Company strongly supports the Indian Armed Forces with its indigenous and licence manufactured products. The Company has also continued to emphasise on self-reliance towards development of indigenous products, diversification into civil segment, enhancement of capacity, support development of defence manufacturing eco-system by developing domestic vendors (including MSMEs) and enhance outsourcing. These efforts will provide steady growth of the Company and opportunities to capitalise on the future requirements arising for Indian Armed Forces." **SP**

BEL crosses ₹10,000 crore landmark turnover

Navratna Defence PSU Bharat Electronics Limited (BEL) has achieved the landmark turnover of more than ₹10,000 crore (Provisional & Unaudited) during FY 2017-18, sustaining double digit growth over the previous year's turnover of ₹8,825 crore.

Some of the flagship projects executed during the year include integrated air command & control system (IACCS), weapon locating radar (WLR), hand-held thermal imager (HHTI), Akash weapon system (Army), naval fire control system, integrated communication system, 3-D tactical control radar (TCR), electronic warfare systems, L-70 gun upgrade, electronic voting machines (EVM) and Voter Verifiable Paper Audit Trail (VVPAT). **SP**

Frances and Oscar happily united

Best actress winner Frances McDormand has been reunited with her Oscar after it was stolen from her table inside the Governors Ball, the official Oscars after-party.

The *Three Billboards Outside Ebbing, Missouri* actress was spotted at the party getting her Oscar engraved. The 60-year-old star realised later that it had gone missing.

The Los Angeles Police Department confirmed to the news agencies that Terry Bryant, 47, was arrested late Sunday night for the alleged crime, and booked early Monday morning. He was charged with grand theft and police set a bail of \$20,000.

McDormand's representative told *USA Today* in a statement: "Fran and Oscar are happily reunited and are enjoying an In-N-Out burger together."

In a statement, the Academy of Motion Picture Arts and Sciences expressed relief that Frances McDormand was reunited with her trophy.

"Best Actress winner Frances McDormand and her Oscar were happily reunited after a brief separation at last night's Governors Ball," the statement read. "The alleged thief was quickly apprehended by a photographer and members of our fast-acting Academy and security teams. The *Three Billboards Outside Ebbing, Missouri* star resumed her celebrations." **SP**



Thieves steal \$5 million from Lufthansa plane at airport in Brazil

A group of thieves stole \$5 million in cash, which had been due to travel from Brazil to Switzerland aboard a Lufthansa jet, at a large freight airport near Sao Paulo, police said.

The spectacular heist, which took place in early March, was completed in a matter of minutes, and authorities have yet to arrest a suspect. The crooks entered Viracopos International Airport's freight terminal using a pickup on which they had "placed stickers mimicking the runway security company's logo," federal police said in a statement.

Germany-based Lufthansa's plane had been traveling from Guarulhos airport in Sao Paulo and was making a stop at Viracopos - Brazil's biggest freight terminal - with Zurich as its final destination.

The stolen money had been held under the auspices of secure



transport provider Brinks, according to the *Folha de Sao Paulo* newspaper.

The daily said five men had threatened security agents on the runway before taking off with the cargo, in barely six minutes.

There was no immediate sign of injuries, the airport said.

Cargo theft is on the rise in Brazil, where most targets are semi-trucks, especially those serving Rio de Janeiro. **SP**

Two arrested for flying drone camera near Taj Mahal

Uttar Pradesh Police detained two tourists, including a foreign national for allegedly flying a drone camera near the Taj Mahal on March 5, 2018.

The tourists were allegedly caught flying a drone camera near the south gate of Taj Mahal from a hotel in the vicinity.

Speaking to a news agency Superintendent of Police (SP) Agra, said, "We received information that a drone was being flown by two tourists, including one foreign national, in the area during morning hours."

"The owner of the hotel has been interrogated too, all people related to this case are being interrogated, action will be taken," the Superintendent of Police added.

Flying a drone camera in the periphery of 500 metres around the Taj Mahal is restricted. **SP**



Follow us on Twitter

SP's
MILITARY
YEARBOOK
S I N C E 1 9 6 5

SP's
CIVIL AVIATION
YEARBOOK

SP's
aviation

SP's
Land Forces

SP's
Naval Forces

SP's
AIRBUZ

SP's
MAI
AN INITIATIVE BY SP GUIDE PUBLICATIONS & SPGA
INTERNAL SECURITY

BizAV India
An initiative by SP GUIDE PUBLICATIONS & SPGA

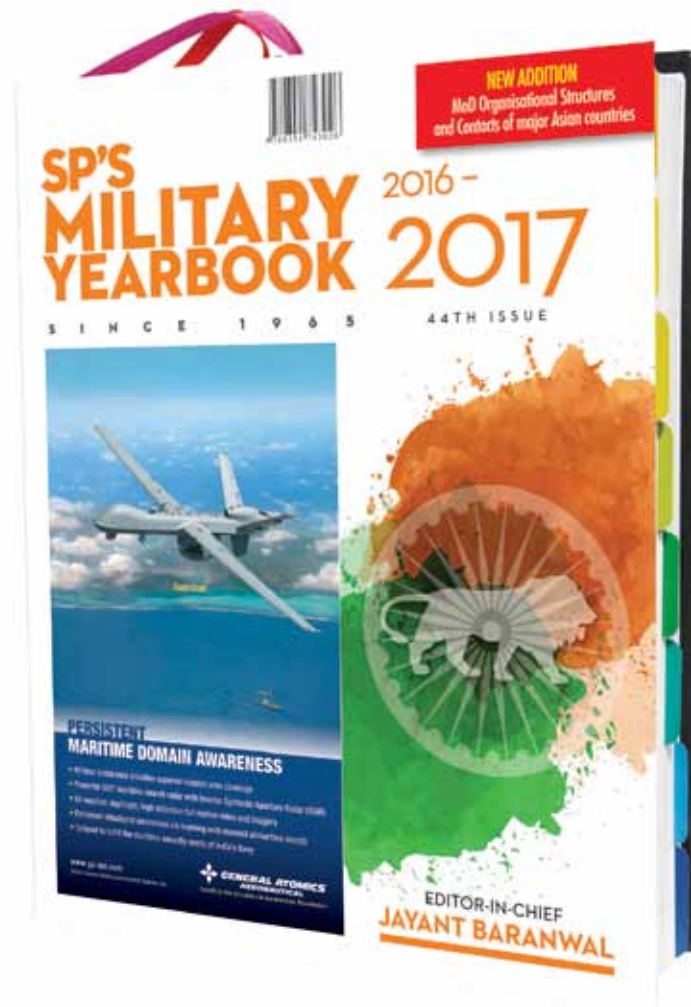


SP GUIDE PUBLICATIONS

www.spguidepublications.com

SP'S MILITARY YEARBOOK 17-2018 IS COMING SOON!
TO AVAIL EARLY BIRD DISCOUNT, ORDER NOW!

INDISPENSABLE COMPENDIUM



**A CONCISE, YET EXTENSIVE PUBLICATION, FOR THOSE WHO SEEK
DEFENCE-RELATED INFORMATION ON ASIA-PACIFIC REGION**



**Reserve Your
Own Copies, Now!**

order@spsmilitaryyearbook.com



SP GUIDE PUBLICATIONS