ASIAN SKY

Fleet Report

ASIA PACIFIC REGION CIVIL HELICOPTERS

YE 2019

SPECIAL FEATURE
eVTOL NEWS IN ASIA
by Vertical Flight Society

SPECIAL FEATURE
URBAN AIR MOBILITY
by HFW

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PUBLISHER'S NOTE

2019 marked yet another challenging year for the rotary industry in the Asia-Pacific region which seems to be a recurring theme, with operators, lessors and service providers being asked annually how they are 'dealing' with the current market conditions. 2019 saw those challenging market conditions manifest themselves with yet another downturn in the O&G market, an overabundance of heavy helicopters and an increasing competitive market space in Asia that many in the industry believe will require further consolidation if the industry is to sustain itself in the future.

In 2019 the offshore O&G fleet saw its most significant drop in the past few years, attributed primarily to the out-of-region relocation of several units from Australia's fleet which were no longer in operation.

Likewise, EMS which posted a y-o-y growth rate of 15.9% in 2018, slowed significantly in 2019 to just 3.3%. Mainland China continued to increase its EMS fleet size in 2019, though at a much slower rate compared with 2018, thus leaving many concerned about what this means for 2020 in this key segment.

These two negative market indicators, of course, leads to the dreaded question: Where and when can we expect a recovery?

For this answer the multi-mission category sustained its growth in 2019, with operators now branching out to a variety of mission segments. Likewise, the charter and corporate segments both saw growth in 2019, perhaps the result of increased tourism and increased traffic, particularly in places like India, Indonesia and the Philippines. So, all is not grim.

The landscape of the leasing market changed drastically from 2018 to 2019 too, due (for the most part) to the acquisition of Waypoint Leasing by the Macquarie Group. The transaction closed at the start of the year, which paved the way for Macquarie to now become one of the top lessors in the region, along with Milestone, Airwork and LCI. Despite this change, however, the number of leased helicopters declined in 2019, which is primarily attributed to the slowdown in O&G.

While the rotary market in 2019 faced its share of challenges, one segment to watch in the Asia-Pacific region is urban air mobility (UAM). This is a key area of growth for OEMs and operators alike and we've already seen the early stages of these emerging technologies making their mark and achieving significant inroads. This is also a topic Asian Sky Group has discussed through our New GA Tech series and China GA Reports and one that will continue to be covered by us.

In this edition of the Asia Pacific Civil Helicopter Fleet Report we discuss the latest eVTOL news in Asia courtesy of Vertical Flight Society and law firm HFW shares the challenges of UAM in Asia, which again is a major industry discussion concerning places like Singapore.

In addition to updates on UAM and eVTOL, several companies shared insights on the market and the latest trends in their respective industry segments. Lease Corporation International (LCI) speaks on the latest developments from the lessor and why the leasing sector is growing. Jet Support Services, Inc. (JSSI) breaks down the maintenance support it offers, along with its financial solutions. Spectrum Aeromed, designer and developer of air ambulance medical interiors for fixed and rotary-wing, shares an update on its Life Flight Network. And, Safran Helicopter Engines discusses the company's Aneto-1K engine fitted on the Leonardo AW189K.

Sincerely,
Jeffrey C. Lowe
Managing Director, Asian Sky Group

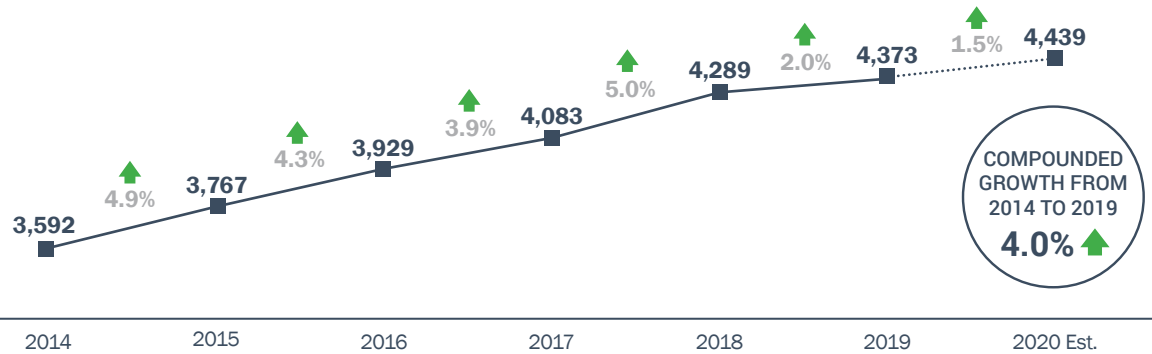
EXECUTIVE SUMMARY

THE ASIA-PACIFIC CIVIL TURBINE HELICOPTER FLEET STOOD AT 4,373 UNITS AT THE END OF 2019, A Y-O-Y GROWTH RATE OF 2% FROM THE 4,289 UNITS AT THE END OF 2018. THE REGION HAS WITNESSED A COMPOUNDED Y-O-Y GROWTH OF 4% OVER THE PAST FIVE YEARS, WITH AN ADDITION OF NEARLY 800 UNITS SINCE 2014. HOWEVER, THE FLEET, WHICH WAS SHOWING PROMISING Y-O-Y GROWTH UNTIL 2018, SHOWED SIGNS OF DAMPENING DEMAND IN 2019. FLEET GROWTH IS EXPECTED TO CONTINUE IN 2020, ALTHOUGH SLIGHTLY LESS WITH A FORECASTED 1.5% Y-O-Y GROWTH.

HELICOPTER FLEET GROWTH

Note: Historical fleet data is based on Asian Sky Group's adjusted and updated numbers.

Historical & Forecast



The growth rate slowed down in 2019, as the fleet experienced a significant increase in the number of deductions from 2018. This reflects a maturing market in the region. Notably, Mainland China's fleet growth rate slowed in 2019. After experiencing 14% y-o-y growth in 2018, the fleet's growth slowed to y-o-y 6% net growth (41 helicopters). This is the first year since 2009 that this market's growth has fallen to a single digit percentage.

Overall, the region saw 84 net additions. Fewer new and pre-owned deliveries were made into the region in 2019, which also witnessed a higher number of deductions compared with 2018.

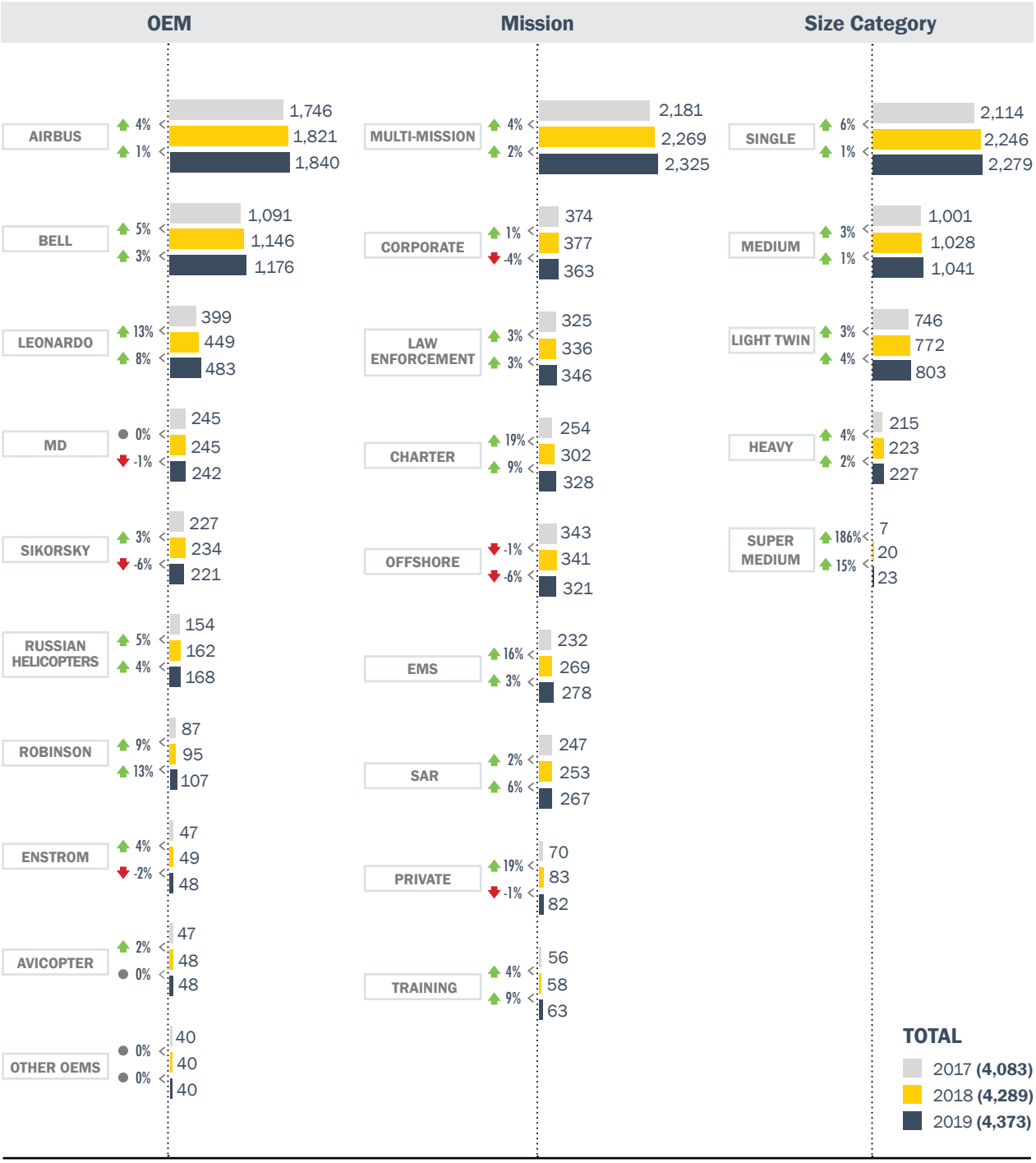
By year end, more than half (53%) of the fleet was utilized for multi-mission purpose . The remaining fleet is dispersed among corporate (8%), law enforcement (8%), charter (8%), offshore (7%), EMS (6%), SAR (6%), Private (2%) and training (1%) mission segments. Helicopters used for charter purposes saw the greatest number of additions in 2019, a trend that continued from 2018. 26 more helicopters were used for charter in 2019, compared with the previous year. Charter operators not only act as a ferry service for passengers, but also work in the tourism segment offering scenic tours and luxury VIP experiences. The biggest addition of charter aircraft was in the Australia and New Zealand fleets where tourism activities are very popular. The largest reduction was seen in the offshore O&G segment, which continued its decline from previous years. The offshore segment saw 20 deductions to its fleet.

Airbus, Bell and Leonardo remained the top three OEMs in the Asia-Pacific region with 42%, 27% and 11% market shares, respectively. Leonardo performed the best in terms of net additions, with an increase of 34 units compared with 2018. Sikorsky saw the most net deductions, with 13.

Single and medium helicopters continue to dominate the market in 2019 with 51% and 24% market shares, respectively.

NET FLEET GROWTH

Positive · Negative · No Change



HELICOPTER FLEET MARKET SHARE

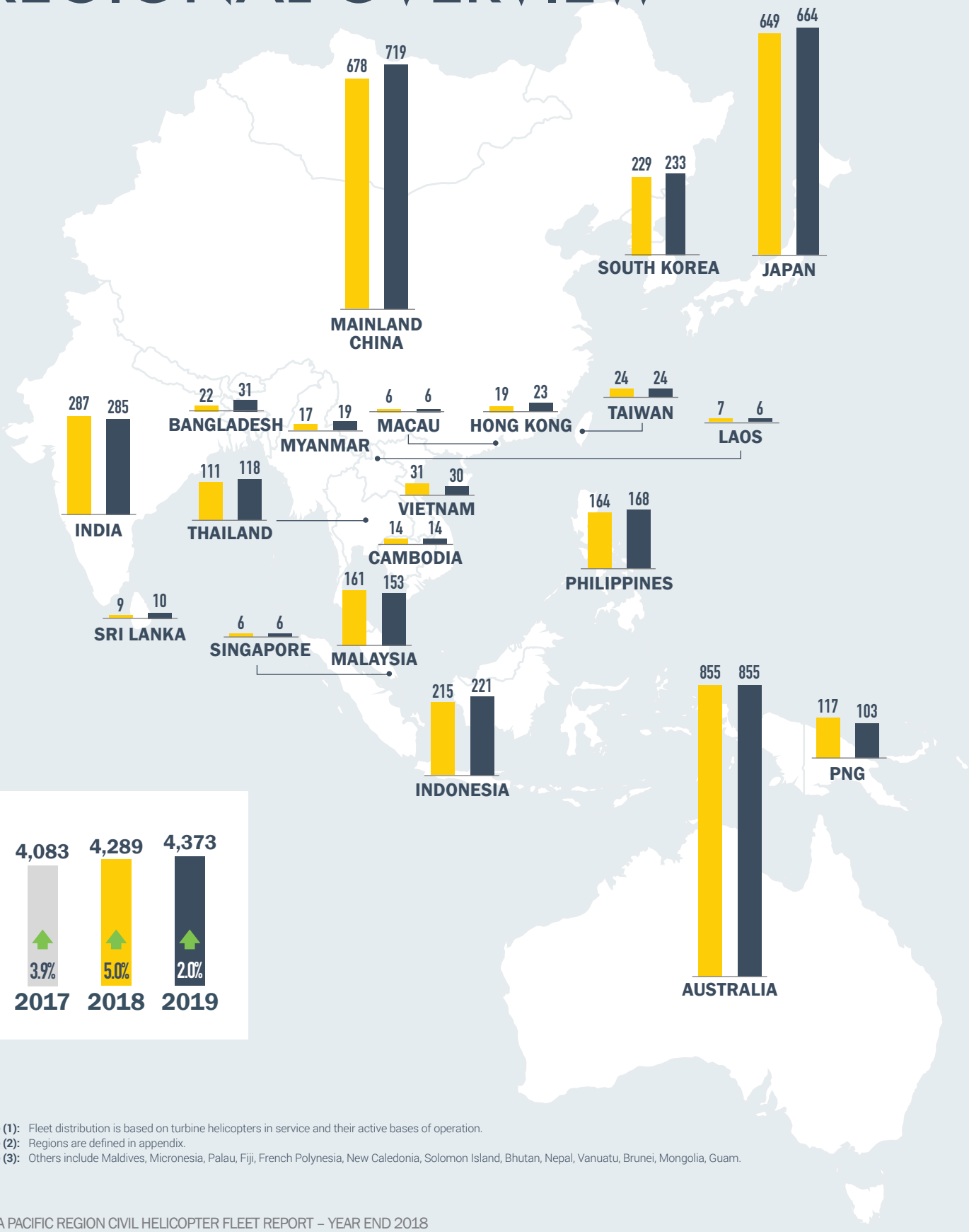
OEM	Fleet Size (Units)	Replacement Cost ($M)
AIRBUS	1,840 **(42%)**	12,837 **(40%)**
BELL	1,176 **(27%)**	6,100 **(19%)**
LEONARDO	483 **(11%)**	5,580 **(18%)**
MD	242 **(6%)**	700 **(2%)**
SIKORSKY	221 **(5%)**	4,004 **(13%)**
RUSSIAN HELICOPTERS	168 **(4%)**	1,697 **(5%)**
ROBINSON	107 **(2%)**	108 **(<1%)**
AVICOPTER	48 **(1%)**	369 **(1%)**
ENSTROM	48 **(1%)**	60 **(<1%)**
OTHERS	40 **(1%)**	416 **(1%)**

Mission	Fleet Size (Units)	Replacement Cost ($M)
MULTI-MISSION	2,325 **(53%)**	13,159 **(41%)**
CORPORATE	363 **(8%)**	2,177 **(7%)**
LAW ENFORCEMENT	346 **(8%)**	2,895 **(9%)**
CHARTER	328 **(8%)**	1,719 **(5%)**
OFFSHORE	321 **(7%)**	5,629 **(18%)**
EMS	278 **(6%)**	2,479 **(8%)**
SAR	267 **(6%)**	3,272 **(10%)**
PRIVATE	82 **(2%)**	330 **(1%)**
TRAINING	63 **(1%)**	210 **(1%)**

Size Category	Fleet Size (Units)	Replacement Cost ($M)
SINGLE	2,279 **(52%)**	6,537 **(21%)**
MEDIUM	1,041 **(24%)**	13,836 **(43%)**
LIGHT TWIN	803 **(18%)**	6,069 **(19%)**
HEAVY	227 **(5%)**	5,040 **(16%)**
SUPER MEDIUM	23 **(1%)**	389 **(1%)**
TOTAL	**4,373**	**$31,871**

Note (1): The YE 2019 Asia Pacific Civil Helicopter Fleet Report includes data only on turbine helicopters in service.
Note (2): "Replacement Cost" figures are based on the assumption that existing helicopters are replaced by the latest versions of their particular OEM variant and at 2019 list prices.
Note (3): The "Multi-Mission" category is defined on page 70.
Note (4): SAR refers to Search and Rescue.
Nore (5): EMS refers to Emergency Medical Services.

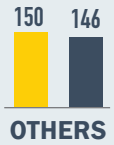
REGIONAL OVERVIEW

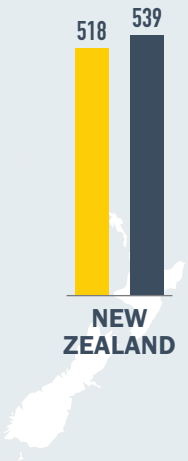


Note (1): Fleet distribution is based on turbine helicopters in service and their active bases of operation.
Note (2): Regions are defined in appendix.
Note (3): Others include Maldives, Micronesia, Palau, Fiji, French Polynesia, New Caledonia, Solomon Island, Bhutan, Nepal, Vanuatu, Brunei, Mongolia, Guam.

Australia, with 855 operational helicopters, has the largest fleet in the region. **Mainland China, Japan** and **New Zealand** follow as the second, third and fourth, with 719, 664 and 539, respectively. Mainland China and New Zealand both recorded significant fleet additions, adding 41 and 21, respectively. **Indonesia** also recorded a notable number of additions with a 6 net fleet growth. **Papau New Guinea (PNG)**, on the other hand, recorded the highest number of deductions in its fleet, with 14.

In regards to regional changes, Greater China still recorded the greatest increase with 45 helicopters. East Asia, Southeast Asia and South Asia continued to see a steady increase in fleet size with 2%, 1% and 3% growths, respectively. Oceania saw a minimal growth at 0.1% in 2019, which is the lowest in Asia Pacific. This growth rate dropped significantly from 5% in 2018, reflecting an aging and mature fleet in this region.





HELICOPTER FLEET (TURBINE ONLY)

LARGEST MARKET

855

AUSTRALIA

LARGEST NET FLEET ADDITION

+41

MAINLAND CHINA

LARGEST NET FLEET DEDUCTION

-14

PNG

FLEET GROWTH FOR THE MAJOR MARKETS

	Net Fleet Growth		Growth Rate	
REGION	**2018**	**2019**	**2018**	**2019**
Greater China	89	45	14% ↑	6% ↑
East Asia	15	19	2% ↑	2% ↑
Southeast Asia	17	9	2% ↑	1% ↑
South Asia	6	9	2% ↑	3% ↑
Oceania	79	2	5% ↑	0.1% ↑
TOTAL	**206**	**84**	**5.0% ↑**	**2.0% ↑**

	Net Fleet Growth		Growth Rate	
COUNTRY/REGION	**2018**	**2019**	**2018**	**2019**
Mainland China	82	41	14% ↑	6% ↑
New Zealand	38	21	8% ↑	4% ↑
Japan	12	15	2% ↑	2% ↑
Bangladesh	6	9	38% ↑	41% ↑
Thailand	-	7	-	6% ↑
Indonesia	2	6	1% ↑	3% ↑
South Korea	3	4	1% ↑	2% ↑
Philippines	8	4	5% ↑	2% ↑
Hong Kong	4	4	27% ↑	21% ↑
Myanmar	4	2	31% ↑	12% ↑
Sri Lanka	-1	1	-10% ↓	11% ↑
Australia	28	-	3% ↑	-
Taiwan	3	-	14% ↑	-
Cambodia	2	-	17% ↑	-
Macau	-	-	-	-
Singapore	-	-	-	-
Vietnam	1	-1	3% ↑	-3% ↓
Laos	-3	-1	-30% ↓	-14% ↓
India	-1	-2	-0.3% ↓	-1% ↓
Malaysia	3	-8	2% ↑	-5% ↓
PNG	11	-14	10% ↑	-12% ↓
Others	4	-4	3% ↑	-3% ↓
TOTAL	**206**	**84**	**5.0% ↑**	**2.0% ↑**

Sorted by 2019 Net Fleet Growth

COUNTRY SNAPSHOTS

FOR FULL COUNTRY PROFILES PLEASE VISIT: **WWW.ASIANSKYMEDIA.COM**

AUSTRALIA

As the most mature and largest civil turbine helicopter market in Asia Pacific, Australia's fleet stood at 855 at year end 2019, no change from 2019. However, 54 helicopters were removed from the fleet, offset by 11 new and 43 pre-owned helicopters added. Australia's offshore segment contracted in 2019, reflected by the large reduction in heavy aircraft. The multi-mission segment saw the most significant growth in 2019, increasing from 471 in 2018 to 481 in 2019.

GREATER CHINA

Greater China, including Mainland China, Hong Kong, Macau and Taiwan, is the fastest developing market in the region – a y-o-y growth of 6%, down from the 14% y-o-y growth seen at year end 2018. Mainland China which drives growth in this region had the largest net fleet addition, with 45 helicopters added — a total of 772. This growth was driven by increases in the multi-mission, law enforcement and EMS segments. Mainland China's EMS fleet is the largest in the Asia-Pacific region.

JAPAN

Japan, the region's third largest fleet, increased by 2% from year end 2018. At year end 2019 its fleet stood at 664. In past years, Japan's EMS has been the largest in the region. At year end 2019, Mainland China replaced it as the top EMS operator. The multi-mission and charter segments saw the most growth over the year.

NEW ZEALAND

New Zealand, the region's fourth largest fleet, saw a 4% y-o-y growth in 2019, increasing to 539 helicopters. Most additions to this market were pre-owned, with only seven new deliveries. The charter market in New Zealand is larger than in most other countries within the region due to the increasing need from tourism. The country's charter fleet grew significantly with a 7% y-o-y growth.

INDIA

India's helicopter fleet saw a net deduction in 2019 (-2), including 15 deductions offset by nine pre-owned additions and four new deliveries. India's offshore fleet increased slightly by two units, in 2019 a 5% y-o-y growth – which was the same as in 2018. India's offshore segment continues be the third largest offshore market in the region.

SOUTH KOREA

South Korea's fleet increased by 2% in 2019, largely attributed to growths in the EMS and charter segments. Notably, Russian Helicopters holds the largest market share in South Korea. To continue its stance, the company put forth a proposal to upgrade its KA32 units — currently the most popular model in the country.

INDONESIA

Indonesia's fleet increased by 3% in 2019, made up of six new and 16 pre-owned helicopters arriving in the country, offset by 16 removed from the fleet. While the multi-mission, charter, corporate and SAR fleets increased, the offshore and EMS fleets both declined.

MALAYSIA

Malaysia's fleet contracted by 5% in 2019 from the previous year. The decrease in its fleet size is attributed to a reduction in the multi-mission, offshore, corporate and charter fleets. All other mission types remained stagnant. While there were three pre-owned additions and two new deliveries, these were offset by 13 deductions to the fleet.

PAPUA NEW GUINEA (PNG)

PNG's fleet contracted by 12% in 2019 from the previous year, which once again continues its decreasing trend since 2015. The multi-mission and charter segments declined, while offshore segment increased. All other mission categories remained stagnant. This market saw only four pre-owned additions and 18 deductions.

PHILIPPINES

The Philippine fleet increased a minimal 2% at y-o-y 2019, attributed to growths in its charter, multi-mission and private segments, which increased 2%, 6% and 20% y-o-y, respectively.

THAILAND

Thailand's fleet expanded in 2019, increasing its fleet size to 118. The country's large law enforcement fleet was the driver of the fleet expansion, followed by the offshore and multi-mission segments. There were six new deliveries and six pre-owned additions to the fleet in 2019.

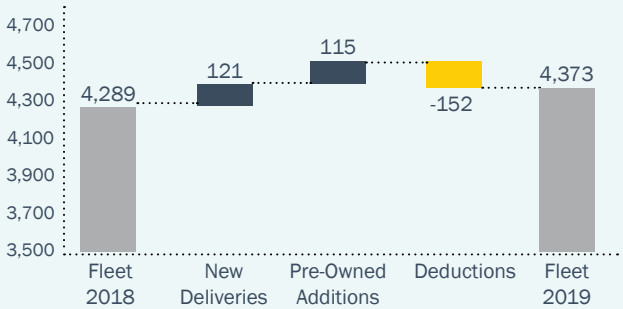
TOTAL FLEET BY COUNTRY/REGION

4,373 in Total

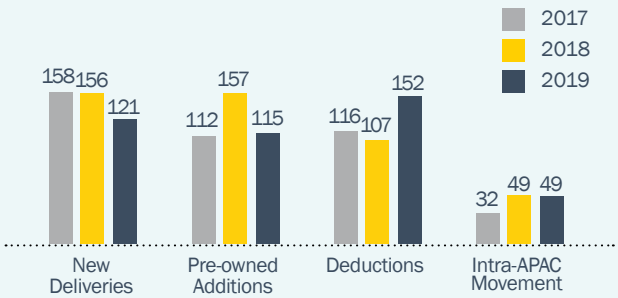
	AIRBUS	BELL	LEONARDO	MD	SIKORSKY	RUSSIAN HELICOPTERS	ROBINSON	AVICOPTER	ENSTROM	OTHERS	TOTAL	% OF TOTAL
AUSTRALIA	323	371	76	22	30		30		2	1	855	20%
MAINLAND CHINA	248	167	110	3	45	49	23	48	24	2	719	16%
JAPAN	351	133	116	15	32	1	12		1	3	664	15%
NEW ZEALAND	295	110	13	105	5	1	5		1	4	539	12%
INDIA	117	85	41	3	6	7	3			23	285	7%
SOUTH KOREA	50	40	27	6	44	62			2	2	233	5%
INDONESIA	83	73	15	4	15	11	3		17		221	5%
PHILIPPINES	95	39	14	13	2		4		1		168	4%
MALAYSIA	77	18	36		11	4	7				153	3%
THAILAND	32	64	9		11	2					118	3%
PNG	38	53	2		2	5				3	103	2%
BANGLADESH	4	11	4				12				31	1%
VIETNAM	12	2	2			14					30	1%
TAIWAN	11	2	3		8						24	1%
HONG KONG	16			5			2				23	1%
MYANMAR	8		6		5						19	<1%
CAMBODIA	12	2									14	<1%
SRI LANKA	5					3	2				10	<1%
LAOS	5					1					6	<1%
MACAU			6								6	<1%
SINGAPORE	4				1		1				6	<1%
OTHERS	54	6	3	66	4	8	3			2	146	3%
TOTAL	1,840	1,176	483	242	221	168	107	48	48	40	4,373	100%

MARKET TREND

ADDITIONS AND DEDUCTIONS



HISTORICAL MOVEMENTS

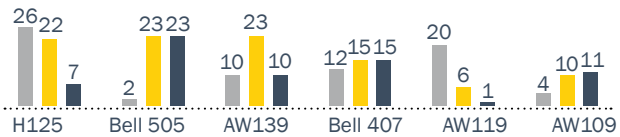


The Asia Pacific region's fleet stood at 4,373; an increase of 2% from 4,289 in year end 2018. The fleet witnessed a total net growth of 84 in 2019, including 121 new deliveries, 115 pre-owned additions and 152 deductions, attributed to out-of-region transactions, retirement or being placed in storage. Of the 152 deductions, nearly half (74 units) had an age of more than 20 years. 49 helicopters changed operating base within the region, with no impact to the total number of the regional fleet.

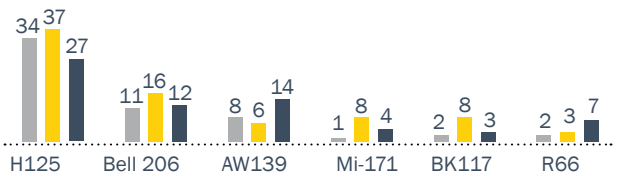
2019 witnessed considerably fewer new deliveries and pre-owned additions, as well as higher deductions compared with 2018. Mainland China saw the largest number of new deliveries, with 41 helicopters delivered in 2019, followed by Japan and Australia with 27 and 11, respectively.

2017 2018 2019

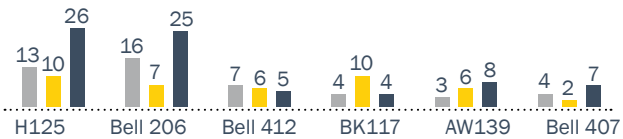
NEW DELIVERIES



PRE-OWNED ADDITIONS



DEDUCTIONS



Note: Models are sorted by total movements in three years

There were 121 new deliveries in 2019. Of the 121 deliveries, 48 (40%) were Bell, 35 (29%) were Airbus and 29 (24%) were Leonardo. The Bell 505, which was the most popular new delivery in 2018 (along with the Leonardo AW139), retained its popularity and saw 23 (19%) new deliveries in 2019, closely followed by the Bell 407 with 15 (12%) new deliveries. AW139, however, saw a slight drop in the number of new deliveries in 2019, dropping to 10 (8%). The drop can be attributed to Kingwing being unable to expand its fleet at the same pace in 2019 as it did in 2018. Notably, COHC, a Chinese offshore operator which mostly utilizes Airbus, Avicopter and Sikorsky helicopters, took ownership of its first offshore-configured AW139 in 2019.

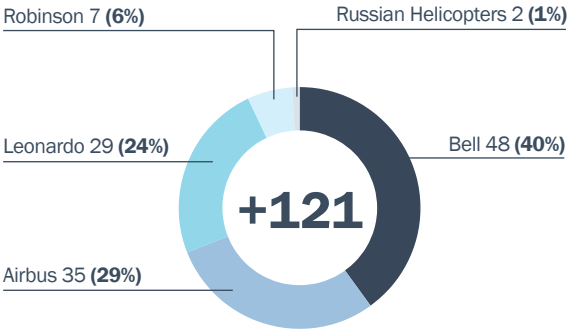
There were 115 pre-owned additions in 2019. Of the 115 pre-owned additions, 50 units (43%) were Airbus, 28 units (24%) were Bell and 17 units (15%) were Sikorsky. The Airbus H125 was the most popular pre-owned addition with 27 units (24%), followed by the Leonardo AW139 with 14 units (12%).

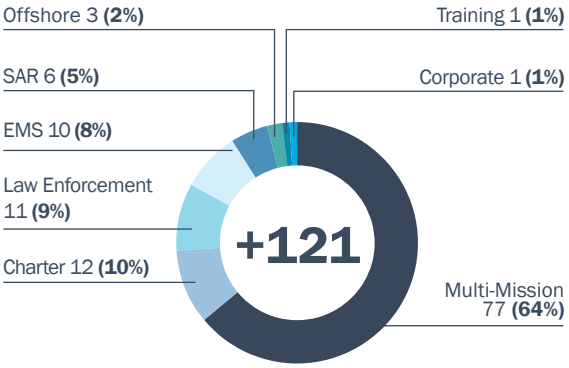
There were 152 deductions in 2019. Of the 152 deductions, 66 units (43%) were Airbus, 46 units (30%) were Bell and 17 units (11%) were Sikorsky. The Airbus H125 was the most popular deduction with 26 units (17%), followed by the Bell 206 with 25 units (16%).

The regional fleet has been growing y-o-y since 2014 and is expected to continue at year end 2020.

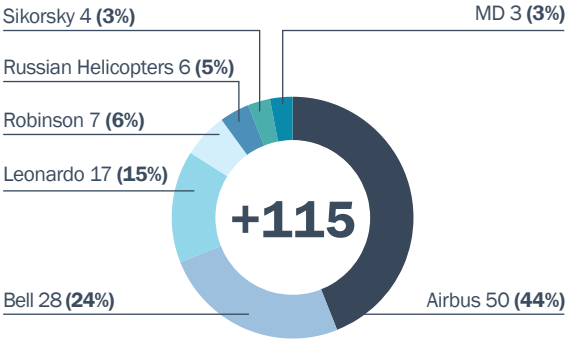
MOVEMENTS BY OEM AND MISSION

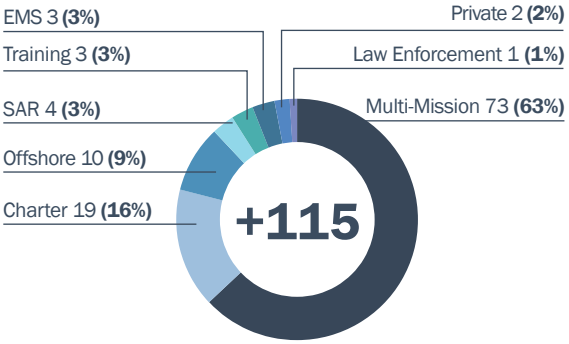
New Deliveries



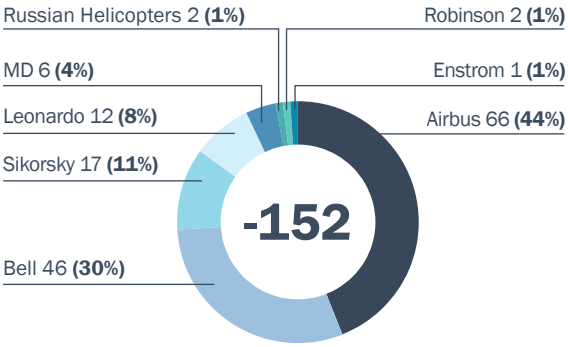


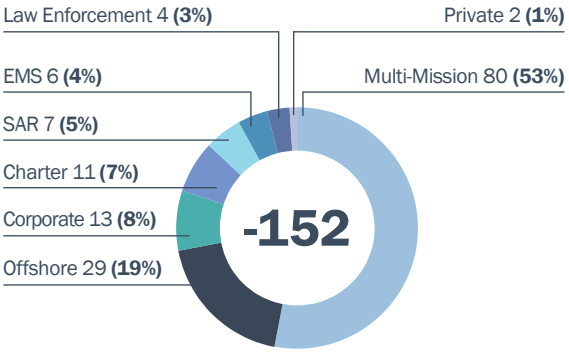
Pre-owned Additions





Deductions





5th Civil Helicopter Southeast Asia Summit

September 23rd–24th 2020, Bali, Indonesia

Organizer

OPPland B2B MEDIA

Co-organizer

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HFW

SPECIAL FEATURE:

URBAN AIR MOBILITY – CHALLENGES AND CHANGE

HFW AEROSPACE SENIOR ASSOCIATE JAMES JORDAN CONSIDERS THE LEGAL AND REGULATORY CHALLENGES OF OPERATING VERTICAL TAKE-OFF AND LANDING (VTOL) VEHICLES AND THE HURDLES THAT LIE AHEAD FOR THE FLEDGLING URBAN AIR MOBILITY (UAM) INDUSTRY.

Image Source: Bell Flight

BACKGROUND

After a world-first first test flight of an air taxi in an urban environment in Singapore at the end of October 2019[1], there has been much excitement surrounding the future of the fledgling UAM industry.

Commentators anticipate that Vertical Take-off and Landing (VTOL) vehicles will become a common sight in our cities' skylines within the next five years.

As with any new technology, there are many unresolved issues with UAM posing legal and regulatory challenges that touch on most aspects of aviation, especially the areas of air traffic control / management as well as flight standards and certification. Other areas of concern also include environmental policy (noise and emissions), public use, land use (i.e. for vertiports / terminals), and liability/insurance arrangements.

THE TERMINOLOGY

UAM is an industry term used to describe the system that enables on-demand, highly automated, passenger or cargo-carrying air transportation services within and around a metropolitan environment, usually in low-altitude airspace.

VTOL or Electric Vertical Take-off and Landing (eVTOL) vehicles are those aircraft best-suited to servicing the development of the UAM industry. VTOL, as the name suggests, refers to aircraft that can take off, hover, and land vertically. While it could include traditional aircraft types, such as helicopters, a new breed of VTOLs is being developed to service the anticipated needs of the UAM market.

Image Source: Bell Flight

WHY NOW?

The UAM market is currently in its infancy, with the first commercialization expected by 2023. However, its projected growth is significant; at a compound annual growth rate of 16.2% by 2030, with an estimated global value of US$3.1B by 2023, accelerating to reach US$7.9B by 2030[2].

WHAT ARE THE BENEFITS OF VTOLs?

As urbanization, population explosions, and the growth of mega-cities continues, governments and private companies must address infrastructure challenges.

VTOLs offer a potential solution to the issue of urban congestion; they minimize the need for a runaway and, in many cases, reduce the need for other modes of transportation to move passengers from those runways to their final destination.

VTOLs also offer more direct point-to-point transportation and, undoubtedly, their most compelling use cases are for urban air taxis and final-mile cargo deliveries.

WHAT ARE THE CHALLENGES OF USING VTOLs?

The development of the UAM market highlights critical regulatory and certification challenges that must be addressed in order to bring UAM transportation into mainstream consumer use.

As with any new aviation technology, the regulatory issues to be considered are numerous and complex. The two most significant from an operational perspective are:

1. AIRSPACE MANAGEMENT:
Maintaining an increasingly diverse airspace while keeping all air traffic moving safely and efficiently will be a significant challenge. A key enabler for the future of UAM and VTOLs will be Unmanned Traffic Management (UTM) systems, which will need to work in conjunction with existing Air Traffic Control (ATC). UTM technology for the UAM market is still at a developmental stage and national regulatory bodies are unlikely to set out ATC guidance until the technology is ready for full deployment.

2. CERTIFICATION:
Many national regulators are still wrestling with the task of providing a regulatory environment for small Unmanned Aerial Vehicles (UAV) with no payloads or passengers. VTOLs potentially add both of these complexities to an aircraft type which comes in both manned and unmanned formats. There have, however, been recent promising developments in Europe in the area of certification.

EUROPE: LEADING THE WAY ON CERTIFICATION

The European Aviation and Space Agency (EASA) has pioneered VTOL certification through the issuance of a Special Condition[3] on 2 July 2019 which applies to "small VTOLs" as follows:

1. aircraft with a passenger seating configuration of 9 or less; and
2. a maximum certified take-off mass up to 3,175 kg.

EASA's VTOL proposal is the first step in a process that will enable a regulatory framework for the safe operation and certification of VTOL aircraft in Europe.

1 https://www.straitstimes.com/singapore/flying-taxi-goes-for-test-spin-in-marina-bay
2 https://www.reportsanddata.com/report-detail/urban-air-mobility-market
3 https://www.easa.europa.eu/sites/default/files/dfu/SC-VTOL-01.pdf
4 https://www.prnewswire.com/news-releases/caac-issued-guidance-on-uav-airworthiness-certification-300796629.html
5 https://www.oliverwymanforum.com/content/dam/oliver-wyman/ow-forum/mobility/2019/2019-Mobility-Index-Report.pdf


Image Source: Embraer

Elsewhere, the Civil Aviation Administration of China (CAAC) announced earlier this year that it will issue guidance on unmanned aerial vehicle airworthiness certification after consulting with five Chinese VTOL manufacturers[4]. The extent to which the CAAC regulations will also cover manned VTOL operations is still under consideration.

ASIA READY FOR UAM

Modern Asian cities which have experienced significant recent population growth stand to gain most from the development of alternative transportation options and have, to date, shown a tendency to adopt a more progressive regulatory environment than traditional aviation hubs in Europe and North America.

A recent Urban Mobility Readiness Index (produced by Oliver Wyman Forum and the Institute of Transportation Studies at the University of California Berkeley)[5] lists five Asian cities (Singapore, Shanghai, Tokyo, Beijing, and Seoul) among the top 10 most prepared cities for UAM. Asia is, therefore, set to be the epicentre for UAM growth going forwards.

LEGAL IMPLICATIONS

The legal issues surrounding UAM and VTOLs are myriad and include:

- risk allocation and liability for damage caused by accidents
- contractual arrangements with end users (i.e. passengers or shippers)
- mandatory insurance limits to ensure adequate public protection
- cyber security and physical safety due to closer operating proximity to potentially malicious actors
- environmental law applicable to noise and land uses
- responsibility for inspection of unmanned VTOLs before flight (like pilots currently do for traditional aircraft)

While it is impossible to consider all of the potential legal issues in this briefing, a closer examination of the potential liability exposures and the management of such exposures warrants further consideration.

LIABILITY EXPOSURES

The liability regimes for the carriage of passengers and cargo on board traditional civil aircraft have developed since the origin of commercial flights in the 1920s. International efforts have led to the development of recognised legal regimes, such as the Montreal Convention 1999 (MC99), with principles from MC99 regularly incepted into national laws concerning domestic carriage.

Arguably, the current liability regimes for passenger aircraft could apply to ticketed passengers taking flights on board VTOLs. That said, the traditional framework is unlikely to be fit for purpose for on-demand/flight-hailing services (i.e. Uber for aircraft); the business model that most UAM providers are likely to utilise.

Operators' liability exposures could be significant in the event that an accident occurs in a busy urban environment, due to the potential to cause injury not just to passengers but also individuals on the ground or in nearby buildings.

In order to facilitate safe flights and reduce the traveling public's barriers to adoption, national legislators need to consider whether existing laws are fit for purpose or whether a new legal liability regime is needed to specifically deal with the unique risk exposures of high-volume urban flight.

RISK MANAGEMENT: CONTRACTS AND INSURANCE

While there will be no shortage of insurance companies willing to provide cover for flying taxi companies and other VTOL operators, it is likely that this technology will pose a significant disruption to current insurance models for individuals, operators and insurance companies.

Recent lessons learnt by the insurance community from developments in the UAV/drone market have demonstrated

> // COMMENTATORS ANTICIPATE THAT VTOL VEHICLES WILL BECOME A COMMON SIGHT IN OUR CITIES' SKYLINES WITHIN THE NEXT FIVE YEARS. //

that traditional policy wordings (such as AVN1C) are probably not fit for purposes when it comes to insuring new technology, such as VTOLs, and new insurance policy wordings will need to be developed.

Manufacturers and operators will also need to consider how to apportion liability among themselves, as well as the risks that they are willing to pass onto end users via their contractual and/or ticketing arrangements. A careful balance will need to be struck as any attempts to shift the risk on to the end user by utilising robust indemnity and liability wording to protect operators could significantly undermine confidence in the industry.

VTOLs VS HELICOPTERS

While VTOLs are undoubtedly a market disrupting technology, operators wishing to establish or supplement existing urban air transport routes should consider whether conventional helicopter types are in fact the best option for their proposed operations.

While the two major helicopter OEMs (Airbus and Bell) have UAM projects in the pipeline, analysts largely agree that traditional rotorcraft sales will not be impacted in the near future as helicopters are still likely to represent the best option in terms of capacity, range and fuel efficiency.

LOOKING AHEAD

Many city administrators have put Smart City policies at the centre of their plans, with UAM a core component.

While the timescale for full deployment is uncertain and many obstacles still lie in wait from a regulatory and legal perspective, UAM and VTOLs undoubtedly have a part to play in the future development of urban environments.

In order for this game-changing technology to truly emerge, it is important that all industry stakeholders lobby governments and regulators to provide a sympathetic legal and regulatory framework that will allow the technology to develop in a safe and open environment.

If this happens, flying to work may be on the horizon sooner than you think!

ABOUT THE AUTHOR

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SPECIAL FEATURE:

ELECTRIC VTOL NEWS IN ASIA

BY THE VERTICAL FLIGHT SOCIETY

THE ELECTRIC VTOL NEWS™, PUBLISHED BY THE VERTICAL FLIGHT SOCIETY, HIGHLIGHTS THE INCREDIBLE PROMISE AND PROGRESS OF ELECTRIC AND HYBRID-ELECTRIC POWERED VERTICAL TAKEOFF AND LANDING (EVTOL) AIRCRAFT, FOCUSING ON NON-HELICOPTER VTOL AIRCRAFT LARGE ENOUGH TO CARRY PASSENGERS WITHOUT CONVENTIONAL HELICOPTER FLIGHT CONTROLS.

HERE'S A ROUND-UP OF THE EVTOL NEWS THAT MADE HEADLINES IN AND AROUND ASIA.

EHANG

Guangzhou, China-based drone maker EHang delivered the first batch of "passenger grade" EHang 216 autonomous aerial vehicles (AAVs) in June 2019, followed by a second batch in October. The 216 model is a two-seater, with 16 propellers and can carry up to 220 kilograms.

EHang has already conducted over 2,000 flight tests around the world, and is working with regulatory authorities including the European Union Aviation Safety Agency (EASA), the International Civil Aviation Organization (ICAO), Civil Aviation Administration of China (CAAC), and others "to ensure that global

regulatory standards are able to efficiently meet the demands of future urban air mobility," according to the company.

In October, the company struck a strategic partnership with telecommunications giant Vodofone. As an exclusive partner for EHang, Vodofone will equip all EHang AAVs operating in Europe with Vodafone SIM cards and connectivity.

Its most recent partner is with property developer Heli Chuangxin Real Estate Co. Ltd. to build the infrastructure for the world's first commercial in-city sightseeing urban air mobility route in Guangzhou. The two companies plan to establish a low-altitude air transportation network that shuttles passengers and cargo in a safe, fast and cost-efficient manner. The pilot program enables EHang to test more flight routes and vertiports before moving into passenger-grade commercial operations.

In 2018, EHang began commercial operations of air cargo transportation in and near Guangzhou, working with the express delivery company DHL-Sinotrans and retail company Yonghui.

The drone maker filed with the US Securities Exchange Commission to sell an estimated US$100M in depository shares in an initial public offering. Terms have since been set for the company's IPO, with intentions to raise approximately US$43M at a price range of US$12.50 to US$14.50 per share.

VOLOCOPTER

In August of 2019, Volocopter revealed its fourth-generation electric vertical takeoff and landing (eVTOL) design, the VoloCity, intended to be its first production aircraft. The company says that the VoloCity has been designed to meet the safety standards specified by EASA and incorporates user feedback, as well as test data from all previous Volocopter generations, including more than 1,000 test flights.

With a calculated range of 22 miles (35 km) and an airspeed of 68 mph (110 km/h), the VoloCity is designed to serve as an on-demand, inner-city air taxi. Like Volocopter's previous models, the VC200 and 2X, the VoloCity is powered by 18 electric propellers and has seats for two passengers. However, the VoloCity has a number of refinements, including increased flight efficiency through more aerodynamically shaped propeller support beams and a newly introduced stabilizer for increased lift and additional stability in forward flight.

In September 2019, the company announced it had signed the first closing of its Series C funding round, by Zhejiang Geely Holding Group (which had previously acquired US-based Terrafugia — developer of a roadable aircraft and a flying car), followed by new and existing investors from Europe, North America and Asia. The funds will be used towards bringing the VoloCity aircraft to commercial launch within the next three years. This closing increases the total capital that Volocopter has raised to US$94M. Geely and Volocopter have also entered into a joint venture to bring urban air mobility to China.

After successful flights with its 2X demonstrator at the Helsinki Airport and in Stuttgart, Germany, Volocopter made its first manned flight over Singapore's Marina Bay in October. The Volocopter 2X flight was just under a mile (1.5 km) and lasted for two minutes at an average cruising height of 130 ft (40 m).

This was the final demonstration of a demanding test series to verify and validate the ability of Volocopter air taxis to fly over the area. Government authorities including the Singapore Ministry of Transport (MOT),

the Civil Aviation Authority of Singapore (CAAS) and the Economic Development Board (EDB) supported Volocopter in this testing phase and plan to continue to do so in the future. "This flight kicks off Volocopter's efforts to bring commercial air taxi services to Singapore," the company stated.

The company, alongside Skyports, Ltd., also unveiled what they called "the world's first full-scale air taxi vertiport" at the Intelligent Transport Systems (ITS) World Congress in Singapore. According to Volcopter, "The VoloPort is designed to offer an exceptional passenger experience, using the most modern safety and security processes. Its modular design can be easily adapted to fit rooftops, railway stations, parking lots and other metropolitan locations. It will accommodate a wide range of electric air taxis, serving business travelers, tourists and anyone else fed up with sitting in traffic."

Volocopter and Skyports also announced that they will continue their partnership with the aim of introducing commercial air taxi services in Singapore and beyond. In support of its expansion plans, Volocopter opened an office in Singapore in January 2019 and has started to build up a local team. Skyports followed suit in September 2019. Based in London, Skyports also develops, implements and operates end-to-end drone deliveries globally.

The company has also embarked on expansion into the logistics and agriculture industries with its VoloDrone — an unmanned, fully electric, heavy-lift drone capable of carrying a payload of up to 200kg (440 lbs). With a standardized payload attachment, VoloDrone can serve a great variety of purposes from transporting boxes, to liquids, to equipment and more; the drone was specifically engineered to serve challenging missions.

Volocopter is partnering with American agricultural company, John Deere on a large drone adapted for agricultural use. Featuring a potential payload of 200kg, the VoloDrone is able to cover an enormous area, especially under difficult operating conditions.

In December 2019, Volocopter was awarded the Design Organization Approval (DOA), following a series of audits. The approval is a confirmation by EASA that Volocopter is performing its tasks as an aircraft manufacturer in a controlled and safe manner.

XTI AIRCRAFT COMPANY

XTI Aircraft Company, developer of eVTOL aircraft — namely the Trifan 600, participated in an investment trade fair in Guizhou Province, China in September. A draft agreement was signed regarding the formation of a joint venture in China that could provide the means to assemble and support the TriFan 600 aircraft in Guizhou Province, as well as to market and sell in a specified geographical area.

XTI has since received utility patents from the Japanese Patent Office and the China National Intellectual Property Administration (CNIPA) for the technology and configuration of the TriFan 600. "These two patents together provide broad protection for our unique aircraft in the significant Asian market, and enable us to continue to expand our global market," said Robert LaBelle, Chief Executive Officer of XTI.

Also expanding into Oceania, XTI entered into a sales and services agreement with aircraft distributor, Heliflite — headquartered in Australia. The agreement includes engineering and maintenance services for the TriFan 600, as well as a role in XTI's pre-sales and sales program. The exclusive agreement covers Australia, New Zealand and the rest of Oceania, as well as Indonesia and the Philippines.

The company signed a term sheet with a lead investor for a minimum US$17M and maximum US$29M financing. The terms provide for a combination of equity and convertible debt. Closing was tentatively scheduled for January 2020 and is contingent on both parties completing due diligence and signing a final definitive agreement.

HYUNDAI – UAM DIVISION

Hyundai Motor Group revealed in September 2019 that it established an Urban Air Mobility Division and appointed Dr. Jaiwon Shin as its Executive Vice President and Head. Shin was most recently the NASA Associate Administrator for Aeronautics at NASA, where he shaped the agency's aeronautics research and development strategy for 11 years.

Hyundai noted that "his expertise in revolutionary airframe, engine, aviation safety, and air traffic management technologies will allow Hyundai Motor Group to take a lead in the fast-growing urban air mobility sector. The new business unit will develop core technologies and innovative solutions for safe and efficient airborne travel."

HANWHA SYSTEMS & OVERAIR

South Korean industrial giant Hanwha announced in July that it was investing US$25M in a spin-off from Karem Aircraft, Inc., named OverAir. The new company will be dedicated to bringing its all-electric air taxi vehicle — Butterfly — to market. The Butterfly is being developed for Uber Elevate and uses Karem's Optimum Speed Rotor technology to power a vectored-thrust vehicle with four large rotors mounted on the wings and tail. Butterfly's large, slow-turning rotors provide efficient lift and reduced noise, which is key for operating at scale in cities.

Hanwha Systems is leading the US$25M Series A investment into OverAir, pending regulatory approval. Hanwha brings financial support, a deep history of manufacturing and industrial scale to accelerate the Butterfly air taxi vehicle to market. In December, the investment received approval from all necessary authorities.

SKYDRIVE — JAPANESE FLYING CAR DEVELOPER

Japanese flying car developer SkyDrive announced in September that it secured US$14M through third-party share issuance funding and subsidies, for a total of US$18.5M raised.

SkyDrive, Inc. was established by the members of Cartivator— a group of aircraft, drones and automotive engineers. In December 2018, the first Japanese outdoor flight test of a flying car (unmanned) was conducted with regular testing throughout 2019. Japan's largest flying car flight test field was opened in Toyota City in June 2019 as part of a "partnership agreement of flying car development for the creation of new industries" with the cooperation of Aichi Prefecture and Toyota City. SkyDrive said that development for this year's manned flight test launch is underway, as well as preparation for the flight demonstration in summer of 2020 and sales release in 2023.

VERTICAL FLIGHT SOCIETY SPEARHEADS VTOL COLLABORATION

BY KENNETH I. SWARTZ, VFS BOARD MEMBER

OVER THE PAST FEW YEARS, YOU MAY HAVE SEEN NEWS REPORTS ABOUT IMAGINATIVE NEW ELECTRIC VERTICAL TAKEOFF AND LANDING (eVTOL) AIRCRAFT BEING DEVELOPED BY A WIDE RANGE OF COMPANIES BOTH INSIDE AND OUTSIDE THE TRADITIONAL AEROSPACE INDUSTRY.

The idea of viable electric-powered VTOL aircraft — also called flying cars, air taxis and urban air mobility (UAM) — may have come as a complete surprise since there was little public discussion of eVTOL aircraft concepts prior to 2017.

That's not the case for the Vertical Flight Society, which organized the world's first eVTOL workshop six years ago when it recognizing that a convergence of technologies — lighter weight electric motors, high density batteries, fly-by-wire flight controls, integrated avionics and lightweight composite structures — would engender next-generation of VTOL aircraft quite different from traditional helicopters.

LEADING THE ELECTRIC VTOL REVOLUTION

Over 100 visionary engineers and scientists attended VFS's first annual eVTOL meeting in 2014. Many of these people are today leading advanced eVTOL aircraft developments at companies like Airbus, Aurora, Bell, Boeing, Hyundai, Joby, Kitty Hawk, Piasecki and Sikorsky, or are in key positions at organizations like Uber, NASA, universities, etc.

Many of VFS's 120 corporate and 6,000 individual members in industry, government and academia are actively engaged in eVTOL developments.

VFS now has some 250 eVTOL aircraft concepts listed in the "World eVTOL Aircraft Directory" on its website, www.evtol.news, the first and most comprehensive resource online, created to track the emerging eVTOL industry in 2017. The free site also includes more than 200 original news articles, links to more than 100 hours of eVTOL educational videos and many other resources, including the world's first eVTOL short course.

The eVTOL revolution is being supported by some of the world's largest aerospace companies (e.g. Airbus, Bell, Boeing and Embraer), automotive companies (e.g. Audi, Daimler, Geely, Honda, Hanwha, Hyundai and Toyota), and technology leaders and investors (e.g. Intel, Tencent and Uber).

FOUNDED BY HELICOPTER PIONEERS

VFS is the world's oldest and largest vertical flight professional organization. It was founded as the American Helicopter Society in 1943 by Igor Sikorsky and other helicopter pioneers who believed that collaboration was essential to overcoming technical, economic and societal barriers.

Today's eVTOL aircraft developers face many of the same challenges and VFS has extensive resources to overcome these challenges and mitigate risk.

For more than 75 years, the Society has led technology, safety, advocacy and other important initiatives to advance vertical flight, and has been the primary forum for interchange of information on VTOL technology. VFS has 22 active technical committees and the world's largest online vertical flight library with more than 13,000 technical articles and papers. VFS provides valuable educational support, including scholarships, workshops and online video courses on VTOL technology.

Members can also learn from leaders and their peers through meetings and events at 24 regional chapters, including seven in Asia and the Pacific — in Australia, China, India, Japan, Korea, Singapore and Turkey – where VFS is also a co-sponsor of the annual Asian/Australian Rotorcraft Forum.

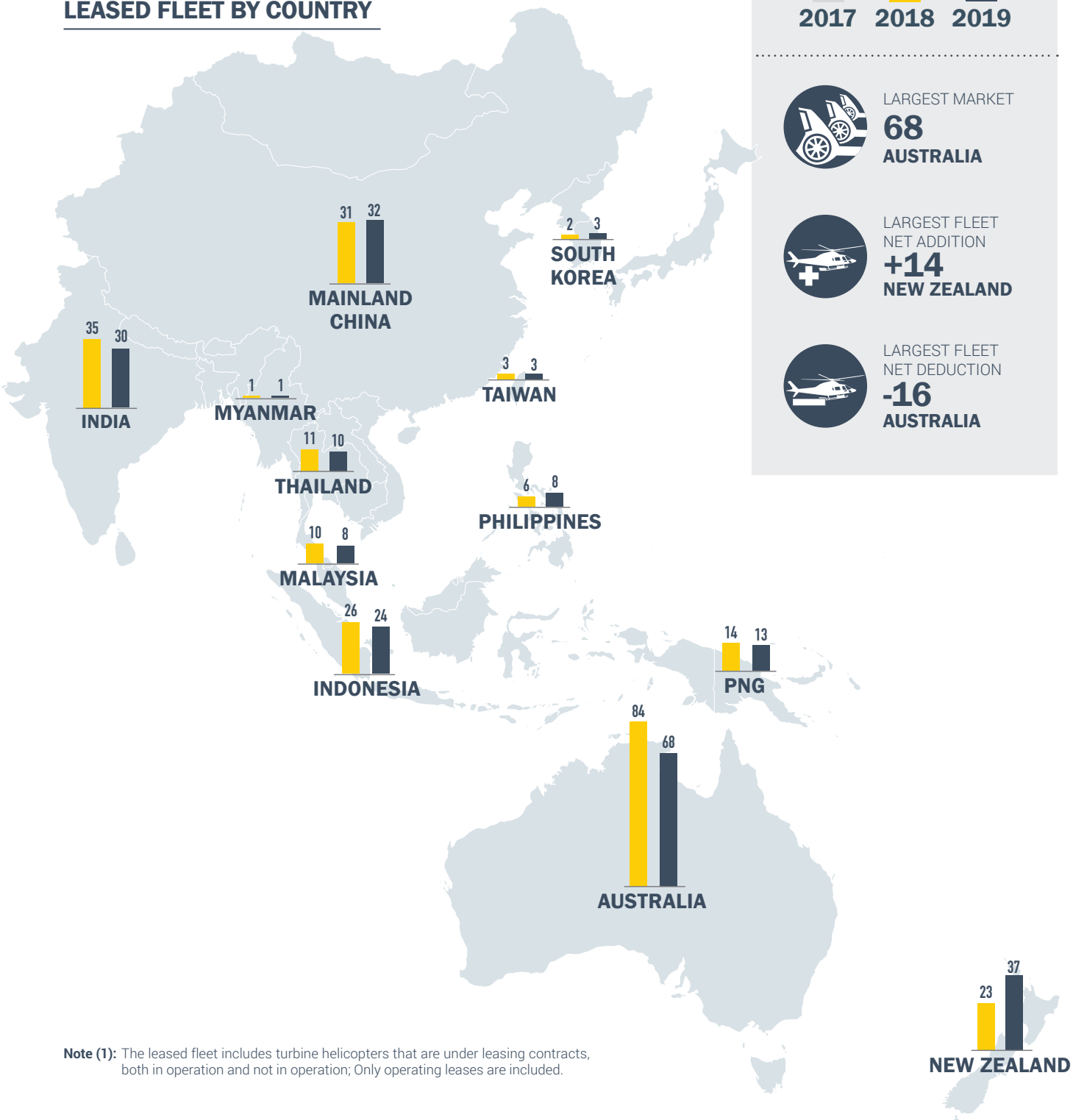
The Vertical Flight Society's 76th Annual Forum & Technology Display being held in Montreal, Quebec, Canada on May 19-21, 2020 is the world's leading international technical event on vertical flight technology. The conference spans three days and includes over 250 technical papers on every discipline from Acoustics to Unmanned Systems, as well as 50+ invited presentations by leaders in the military, government agencies and the emerging eVTOL industry.

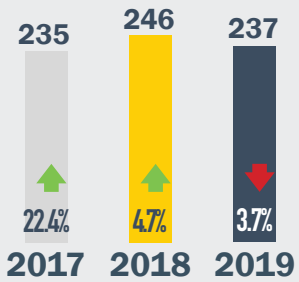
All individuals and organizations interested in vertical flight and benefiting from the Society's extensive resources are invited to become members of VFS.

More information is available at: **www.VTOL.org**

MARKET UPDATE:
LEASING MARKET

LEASED FLEET BY COUNTRY





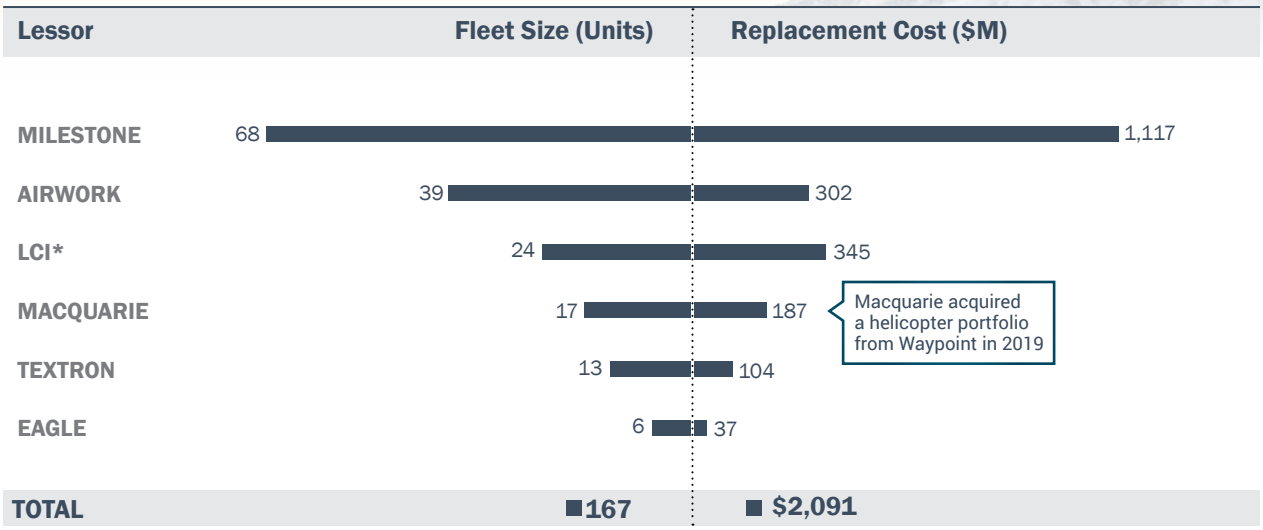
LARGEST MARKET
68
AUSTRALIA

LARGEST FLEET NET ADDITION
+14
NEW ZEALAND

LARGEST FLEET NET DEDUCTION
-16
AUSTRALIA

Note (1): The leased fleet includes turbine helicopters that are under leasing contracts, both in operation and not in operation; Only operating leases are included.

MAJOR LESSOR MARKET SHARE



Note (2): 'Replacement Cost' figures are based on the assumption that all existing helicopters would be replaced by the latest versions of their particular OEM variant and at 2019 list prices.

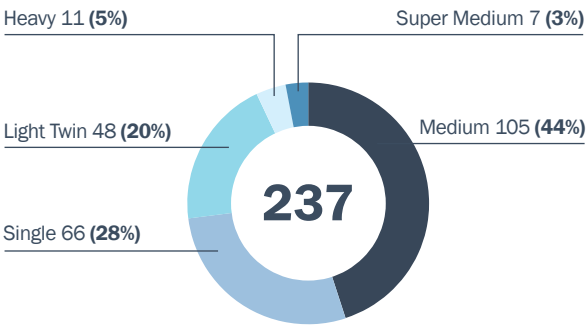
*Includes 4 managed helicopter units previously owned by Waypoint.

MAJOR LESSOR (BASE OF OPERATION)

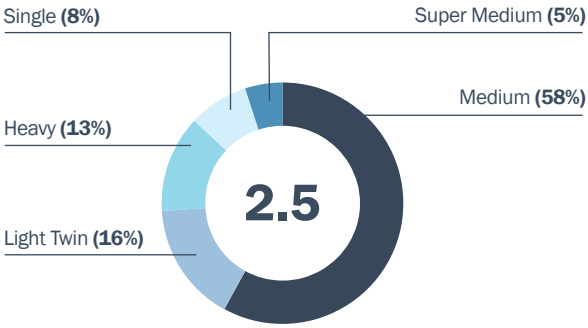
	MILESTONE	AIRWORK	LCI	MACQUARIE	TEXTRON	EAGLE	TOTAL
AUSTRALIA	22	6	16	7		3	54
NEW ZEALAND		25		2			27
INDIA	15				3	1	19
MAINLAND CHINA	11		3	2			16
INDONESIA	8				5	1	14
PNG		8	1	2		1	12
THAILAND	9						9
PHILIPPINES					5		5
MALAYSIA	2		2	1			5
TAIWAN				3			3
SOUTH KOREA	1		1				2
MYANMAR			1				1
TOTAL	68	39	24	17	13	6	167

LEASED FLEET BY SIZE CATEGORY

Fleet Size (Units)

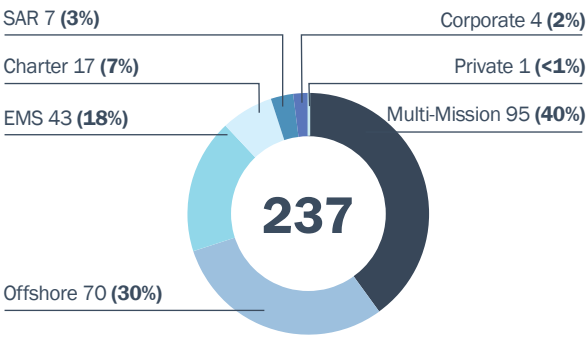


Replacement Cost ($B)

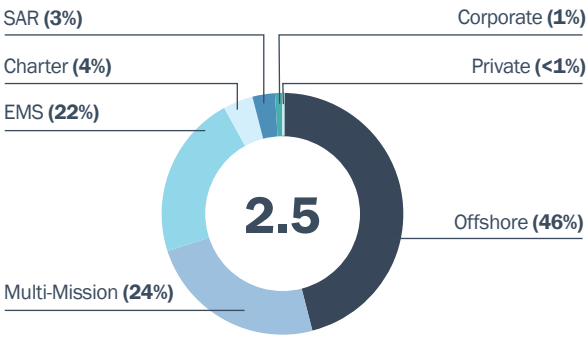


LEASED FLEET BY MISSION

Fleet Size (Units)



Replacement Cost ($B)



There were a total of 237 civil turbine helicopters leased in the Asia-Pacific region at year end 2019. The leasing market, which had started showing signs of weakening in 2018, contracted in 2019, shrinking by nearly 3.7% from 246 units in 2018. Australia saw the largest decrease in leased helicopters, decreasing by 16. Despite having the largest decrease in leased units, Australia still had the highest number of leased helicopters (68); followed by New Zealand (37), Mainland China (32) and India (30).

The largest lessor in the region continued to be Milestone, with a fleet of 68 leased helicopters, a decrease of around 13% from the 79 leased helicopters in 2018. Airwork and LCI came in second and third with a fleet of 39 and 24 leased helicopters, respectively.

In terms of replacement cost, the 'Big Four' lessors — Milestone, Airwork, LCI and Macquarie – those with over $150 million of leased assets, accounted for approximately 78% of the total fleet; boasting assets of US$1.1B, US$302M, $345M and US$187M replacement cost, respectively.

Of the 237 helicopters leased in the Asia-Pacific region, 88 (37%) were Airbus, 61 (26%) were Leonardo and 54 (23%) were Bell. The Leonardo AW139 was the most popular leased helicopter model, with 49 units (21%). Airbus H125 with 28 units (12%) was the second most popular leased helicopter followed by the Airbus BK 117 with 24 leased units (10%) each.

MAJOR LESSOR (MODEL)

		MILESTONE	AIRWORK	LCI	MACQUARIE	TEXTRON	EAGLE	TOTAL
AIRBUS	AS355		4					**4**
	AS365	4						**4**
	BK117		23					**23**
	H125		8		1			**9**
	H130	2	2					**4**
	H135			2	3			**5**
	H145	2	2	1	3			**8**
	H175	2						**2**
	H225	1						**1**
BELL	Bell 204						2	**2**
	Bell 212						1	**1**
	Bell 407					4	2	**6**
	Bell 412	9				5	1	**15**
	Bell 429					4		**4**
LEONARDO	AW139	20		18	6			**44**
	AW169	3		1	3			**7**
	AW189	2		2				**4**
SIKORSKY	S-76C++	9			1			**10**
	S-76D	5						**5**
	S-92	9						**9**
	Total	**68**	**39**	**24**	**17**	**13**	**6**	**167**

Around 40% (95 units) of the helicopters leased are used for multi-mission operations, followed by offshore O&G helicopters with 30% (70 units) of the total leased fleet. The underperformance of the offshore market in 2019 resulted in a significant drop of helicopters leased for offshore operations — by 16 units. Additionally, 43 helicopters (18%) are used for EMS operations. This number is expected to grow in the future.

Most of the helicopters leased belong to the medium-sized category, with 105 (around 44% of the total leased fleet), followed by single-engine and light-twin models, with 66 (around 28%) and 48 (around 20%), respectively. With the offshore market struggling, a number of the leased helicopters were returned to the lessors and/or moved out of the region. Heavy helicopters were affected the most, with the heavy-sized leased fleet decreasing by 11 units, a 50% drop since 2018.

2019 witnessed a considerable change in the Asia-Pacific leasing market landscape. With overall revenue and fleet utilization rates decreasing, Waypoint Leasing, one of the biggest lessors in Asia Pacific until 2018, filed for bankruptcy in November of the same year. It was subsequently acquired by Australia-based Macquarie Group. The transaction, which closed in the first quarter 2019, resulted in Macquarie becoming a major player and one of the top lessors in the region in 2019, a standing previously held by Waypoint Leasing.

The bankruptcy, coupled with restructurings by PHI and Bristow, raises serious concerns for the offshore market. These can be seen as warning signs for the offshore market, which had been a major driving force for the leasing market in the region. As the EMS market grows in Asia Pacific, it may eventually replace offshore O&G as the main growth driver for leasing companies.

NEXT GENERATION LESSOR

LCI | INTERVIEW WITH **JASPAL JANDU,** CHIEF FINANCIAL OFFICER

Interview by Litalia Yoakum

LCI ENTERED THE HELICOPTER LEASING MARKETPLACE IN 2012, WITH A US$400MN COMMITMENT FOR THE PURCHASE OF A FLEET OF LEONARDO HELICOPTERS. LCI WENT ON TO DELIVER HELICOPTERS TO WESTSTAR IN MALAYSIA AND BABCOCK IN AUSTRALIA, AMONG OTHER OPERATORS. SINCE THEN, THE COMPANY HAS CONTINUED TO PROVIDE HELICOPTERS TO OPERATORS ACROSS THE GLOBE FOR A WIDE-RANGE OF MISSION TYPES.

WHAT KEY DEVELOPMENTS HAVE THERE BEEN AT LCI IN THE PAST YEAR OR SO?

LCI today has a fleet of more than 90 helicopters in service, on order and under management valued at approximately US$1BN. These are made up of the latest technology medium and super medium helicopters from leading manufacturers including Leonardo, Airbus and Sikorsky.

LCI has continued to expand its presence in Asia-Pacific in the past year and it now represents more than 40% of our operation.

In 2019, we delivered two additional helicopters (one Leonardo AW139 and one AW189) to Weststar Aviation Services to support their offshore helicopter in Malaysia, as well as helping them to expand into new international markets in Africa. We have also grown our Australia-based fleet, adding two AW139 units to our fleet of twelve AW139 units already operating there, ten of which are used on EMS (emergency medical services) operations.

Looking across LCI as a whole, we recently launched our first helicopter co-investment vehicle in partnership with the Flexam Tangible Asset Income Fund (part of Flexam Invest Group), which enables investors to participate at a specific transaction level for the first time. The vehicle we established with Flexam contains five aircraft all on long-term lease and is valued at more than US$100MN.

We have also closed a series of new asset-backed helicopter financing facilities with partners including CaixaBank, CIT Group Inc. and Close Brothers Aviation and Marine. This brings the total amount of new helicopter debt financing that LCI raised during 2019 to more than US$400MN.

LCI has also appointed two new members to its advisory board, which is made up of senior industry executives with long and proven track records in the helicopter and other related industries. Mark Stevens previously served as Managing Director of Shell Aircraft, and prior to that in the Royal Air Force. Alejandro Kerschen is the Founder and Managing Partner of Atlantic Alliance and has more than 30 years' experience working with asset managers, financial institutions, corporations, private banks, independent wealth managers and family offices.

HOW WELL-DEVELOPED IS THE ASIA-PACIFIC MARKET FOR HELICOPTER FINANCIERS OR INVESTORS?

The Asia-Pacific helicopter market is developing rapidly. According to Airbus Helicopters' recent helicopter civil market forecast, the Asia-Pacific region represents 36% of global demand for new helicopter deliveries and will account for more than 8,000 new helicopters by 2036. With more than 40% of our fleet deployed in the Asia-Pacific region, we know that there is a strong appetite among helicopter operators across sectors to work with a robust and experienced full-service lessor.

> // LCI HAS CONTINUED TO EXPAND ITS PRESENCE IN ASIA-PACIFIC IN THE PAST YEAR AND IT NOW REPRESENTS MORE THAN 40% OF OUR OPERATION. //

WHY IS HELICOPTER LEASING A GROWING SECTOR?

Demand for helicopters is high thanks to strong growth in emerging markets accelerated, in many cases, by faster deregulation and infrastructure implementation, combined with replacement demand from more mature markets.

In the face of this demand, operating leases, as a form of 'off-balance-sheet' asset financing, present a wide range of benefits, enabling helicopter operators to access the latest, new generation

// TODAY, OUR FLEET COMPRISES APPROXIMATELY US$1BN OF ASSETS IN SERVICE, ON ORDER AND UNDER MANAGEMENT. //

aircraft while keeping their overall debt-to-equity ratios low and effectively managing their risk. As such, the helicopter leasing market is expected to grow significantly in the next five years.

The 'up-front' costs in a helicopter operating lease are typically limited to a security deposit and advanced rental, with no significant pre-delivery payments required. At the end of the lease, there is no 'balloon payment'. Additionally, LCI is often able to fix monthly rental rates at the start of the contract to reduce operators' exposure to adverse movements in currency and interest rates.

Finally, an operating lease moves much of an aircraft's residual value risk from the operator to the lessor, who is better placed to manage the asset as part of a much larger portfolio. LCI can arrange short or long-term leases according to an operator's needs, further reducing the risk profile of their financing strategy.

WHAT SETS LCI APART FROM ITS COMPETITORS?

We entered the helicopter leasing market in 2012, building on a proven track record as a lessor of large commercial aircraft to airlines. Our team's extensive technical knowledge and hands-on experience of cycles in the aviation marketplace means that we are seen by many partners as a 'go-to' lessor, particularly for complex transactions.

Since we entered the helicopter leasing marketplace, our focus has been on developing and maintaining a balanced portfolio, focused on new generation twin-engine medium and super medium helicopters, diversified across operators, geographies and sectors. Today, our fleet comprises approximately US$1BN of assets in service, on order and under management. These are in operation across four continents in multiple sectors including offshore wind, emergency medical services, search and rescue, maritime pilot transfer and oil-and-gas transportation.

Our proven track record, well established leasing platform and global reach mean that we have also been providing asset management services to other helicopter investors for several years. We have developed a world class digital helicopter lease management system, and are adept at transitioning helicopters between operators, mission types and geographies. Some of these transitions have involved significant changes from one role to another, the need for ocean or air transportation for the helicopter, cross border tax considerations and other complexities, all of which LCI can manage seamlessly as a full-service leasing partner to operators across the globe.

Our long-held commitment to sustained but balanced growth across multiple sectors and geographies is also proving an attractive proposition for our financial partners, and this was demonstrated by the oversubscribed demand for a number of our financing transactions this year.

www.lciaviation.com

China Civil Helicopter Operation & Development Forum

第七届中国民用直升机运营发展论坛

2020年5月21–22日，厦门 | May 21st –22nd 2020, Xiamen

Hosted by Supported by ASIAN SKY GROUP 亚翔航空有限公司 Organized by OPPland

www.opplandcorp.com/heli2020

Some Topics

- Introduction on General Aviation Development Policy
- Data Analysis on China Civil Helicopter Operation
- Establishment of China Helicopter Emergency Rescue Response System and Planning on Helicopter Operation Requirement
- ***China Civil Helicopter Operation Development Report 2019*** Release Ceremony
- China Police Aviation Planning Construction and Development Direction
- How to Establish an Accelerated Medical Rescue System?
- Application Analysis on Helicopter Short Distance Transportation in Guangdong-Hong Kong –Macau Greater Bay area
- How can Civil Helicopter Regulation and Policy be Effectively and Seamlessly Applied to Practical Operation?
- Analysis of Helicopter Application on Offshore Wind Power
- How can General Aviation Companies Combine Together to Develop and to Improve Spare Parts Sharing and Business Connection?
- How to Establish the Helicopter Operation and Maintenance System Geared to International Standard?
- Analysis on Current Civil Helicopter Pilot Training Status and Future Trend
- How can Civil Helicopter Establish Diversified Sales and Financing Channels?
- How can Light Helicopter Develop under a Fierce Rating Environment?

Organizing Committee Contact

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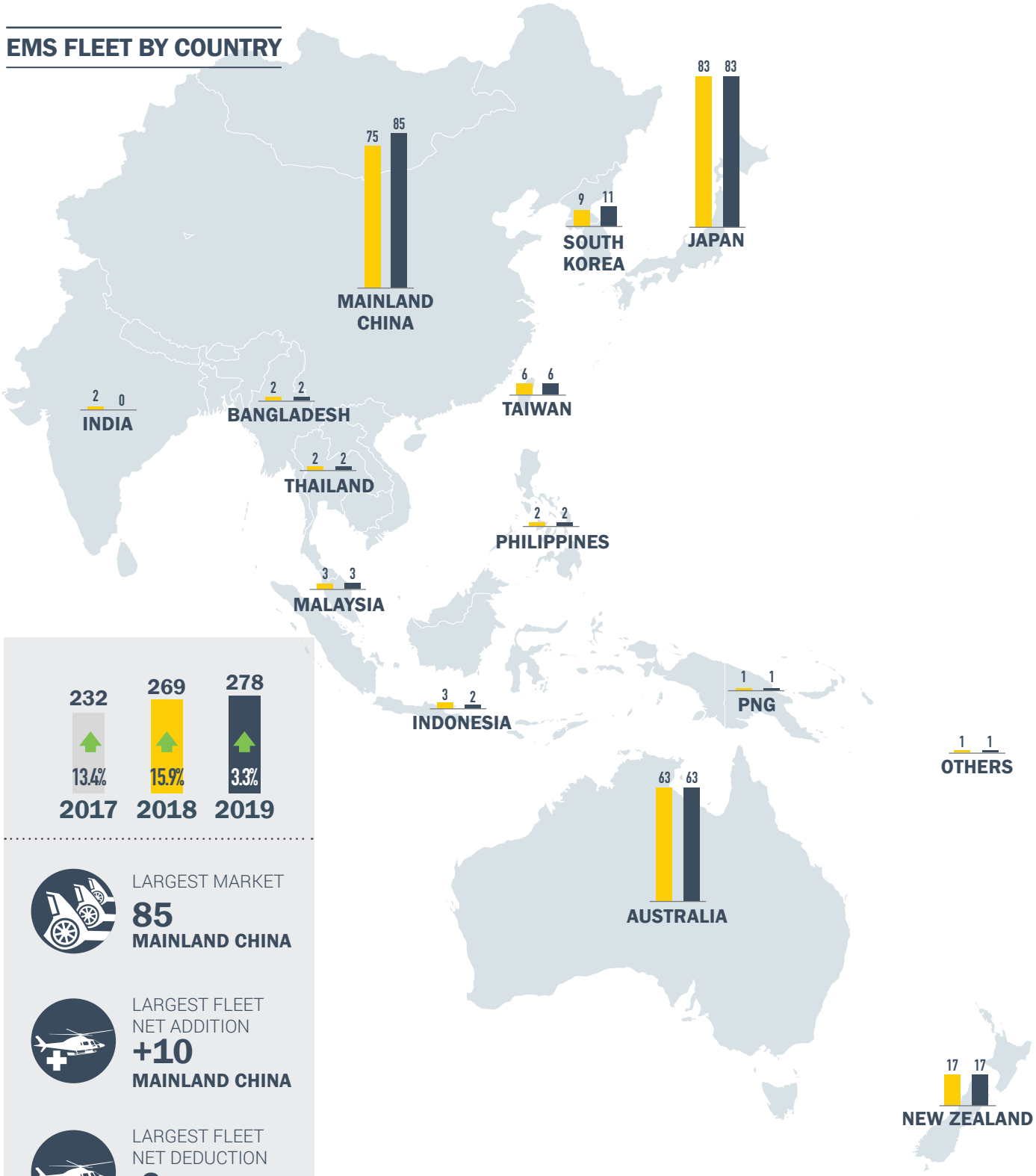
MARKET UPDATE:
EMS MARKET

EMS FLEET BY COUNTRY



2017	2018	2019
232	269	278
13.4%	15.9%	3.3%

LARGEST MARKET
85
MAINLAND CHINA

LARGEST FLEET NET ADDITION
+10
MAINLAND CHINA

LARGEST FLEET NET DEDUCTION
-2
INDIA

ASIAN SKY GROUP

CURRENTLY, THERE ARE 278 EMS HELICOPTERS OPERATING IN THE ASIA-PACIFIC REGION. THIS REPRESENTS AROUND 6% OF THE TOTAL FLEET AND 8% OF THE TOTAL FLEET'S VALUE (IN TERMS OF REPLACEMENT COST). THE NUMBER HAS GROWN BY AROUND 3% SINCE YEAR END 2018 — A GROWTH OF NINE UNITS, ATTRIBUTED TO TEN NEW DELIVERIES, FOUR PRE-OWNED ADDITIONS, ONE MISSION CHANGE TO EMS AND SIX DEDUCTIONS.

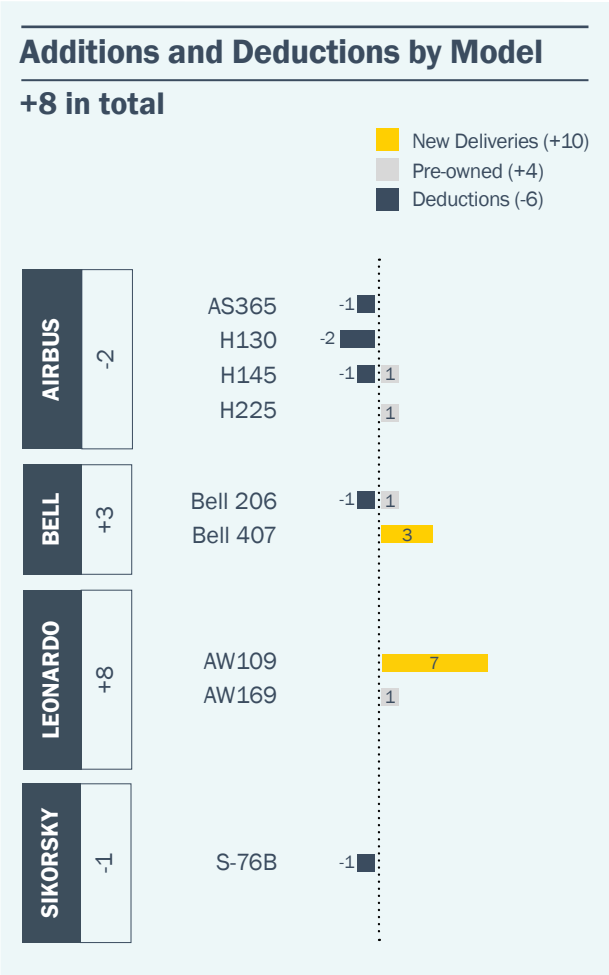
EMS FLEET REGIONAL DISTRIBUTION

Country/Region	Fleet Size (Units)	Replacement Cost[1] ($M)
MAINLAND CHINA	85	588
JAPAN	83	639
AUSTRALIA	63	793
NEW ZEALAND	17	180
SOUTH KOREA	11	121
TAIWAN	6	71
MALAYSIA	3	17
INDONESIA	2	14
THAILAND	2	20
BANGLADESH	2	7
PHILIPPINES	2	17
PNG	1	6
OTHERS	1	6
TOTAL	**278**	**$2,479**

Note (1): 'Replacement Cost' figures are based on the assumption that all existing helicopters would be replaced by the latest versions of their particular OEM variant and at 2019 list prices.

The EMS market has attracted significant attention from operators over the past three years. EMS plays a crucial role in the medical service sector by providing emergency relief and rescue operations. These helicopters aren't limited by topography or weather conditions and help provide emergency relief to remote areas with complex terrain. EMS helicopters can facilitate quick transport to nearby locations and are much faster than ground-based medical transport. In critical cases this can dramatically increase the chance of survival of patients. However, EMS operations are expensive and usually require a large investment to start up.

Mainland China overtook Japan as the largest EMS market with a fleet of 85 turbine helicopters. Mainland China's EMS fleet has more than tripled since 2016. The Central Government has been investing heavily in the EMS market in order to provide emergency services to a nation with a population of more than 1.4 billion people. Japan, which had the largest EMS fleet till 2018, dropped one rank and now has the second largest EMS turbine helicopter fleet in the region — with a fleet of 83 helicopters. Lying along the Pacific Ring of Fire, Japan is prone to natural disasters and, as such, the EMS segment is of paramount importance in



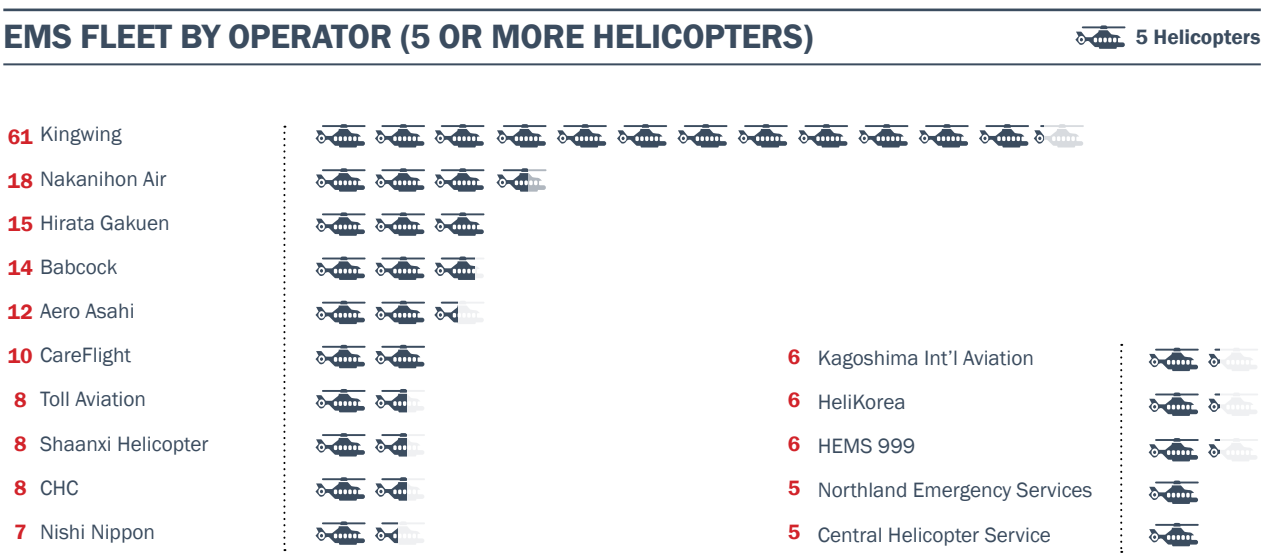
Note: Mission changes are not reflected in the graph above.

the country. With a fleet of 63 helicopters dedicated for EMS operations, Australia has the third largest EMS market in Asia Pacific. Australia has a vast landmass and proportionally low population density, thus transport of those in need by helicopter is much more efficient. Together these three countries represent around 83% of the EMS market in the region.

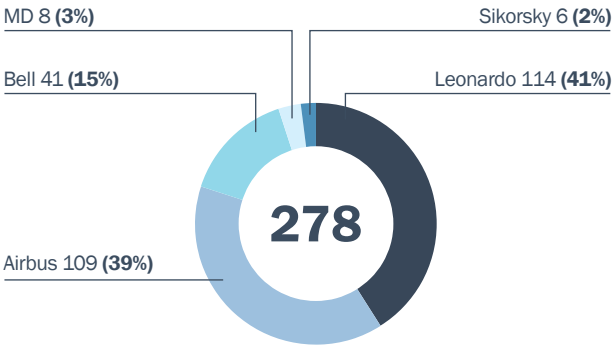
Leonardo AW139 (43) was the most popular model for EMS in the Asia-Pacific region followed by Airbus H135 (41). With a fleet of 61 helicopters, Kingwing — operating out of Mainland China, has the largest EMS fleet in the region. Japan-based operators Nakanihon Air and Hirata Gakuen come in second and third with a fleet of 18 and 15 EMS helicopters, respectively.

Although the EMS sector has been growing y-o-y, the rate of growth has slowed. The fleet, which grew by 37 units (a growth of around 16%) in 2018, only grew by 9 units (a growth of around 3%) in 2019. The industry is facing many challenges and the EMS fleet will have difficulty in continuing its y-o-y growth, unless it can address them. The large investment cost of increasing and maintaining a fleet is the biggest challenge faced by most operators. Government aid can be a possible solution. Certain Governments in the region have been actively supporting the EMS sector and operators by providing contracts and support. A lack of experienced personnel needed to operate the expanding fleet, which are expected to operate in almost all-weather conditions, is the next big issue operators face. The third most important issue is maintaining a sustainable business model capable of overcoming the high operation costs associated with this sector. Once operators can overcome these issues, the growth of the EMS market will be more prominent.

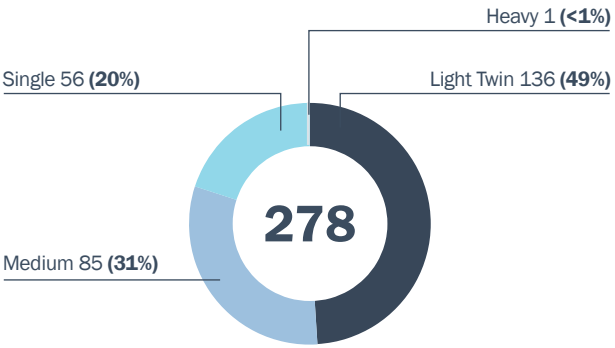
EMS FLEET BY OPERATOR (5 OR MORE HELICOPTERS)



EMS FLEET BY OEM



EMS FLEET BY SIZE CATEGORY



EMS FLEET BY MODEL AND COUNTRY/REGION

		MAINLAND CHINA	JAPAN	AUSTRALIA	NEW ZEALAND	SOUTH KOREA	TAIWAN	MALAYSIA	INDONESIA	THAILAND	BANGLADESH	PHILIPPINES	PNG	OTHERS	TOTAL
LEONARDO	AW109	16	11			5									**32**
	AW119	31													**31**
	AW139	15		28											**43**
	AW169				1	4	3								**8**
AIRBUS	AS365			3			3								**6**
	BK117		7	6	9										**22**
	BO105							3					1	1	**5**
	H125	1		1	1										**3**
	H130	6									2				**8**
	H135	7	34												**41**
	H145		19	1						2					**22**
	H155					1									**1**
	H225					1									**1**
BELL	Bell 206			2					1			1			**4**
	Bell 222				1										**1**
	Bell 230			1											**1**
	Bell 407	8													**8**
	Bell 412		1	19					1						**21**
	Bell 429	1	5												**6**
MD	MD 500			2											**2**
	MD 900		6												**6**
SIKORSKY	S-76A				3							1			**4**
	S-76C++				2										**2**
	Total	**85**	**83**	**63**	**17**	**11**	**6**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**278**

PRODUCT SPOTLIGHT:

MEDICAL AIRCRAFT INTERIOR

DEVELOPED BY SPECTRUM AEROMED

SPECTRUM AEROMED IS KNOWN FOR CAPABILITY, ADAPTABILITY, AND A COMMITMENT TO HELPING EMS OPERATORS SAVE LIVES. THAT'S WHY WHEN THE OPPORTUNITY AROSE TO WORK WITH LIFE FLIGHT NETWORK (LFN) ON A REVISED VERSION OF THE MEDICAL INTERIOR SPECTRUM HAD DESIGNED FOR THE BELL 429 HELICOPTER A FEW YEARS PRIOR, THERE WAS NO HESITATION.

Since 1991, this North Dakota company has designed award-winning medical interiors and equipment for all kinds and sizes of aircraft, most of which are designed to fit several different aircraft. But the company is no stranger to combining engineering know-how, technical skill and customer service to create unique solutions for individual clients.

Spectrum Aeromed's vice-president and account executive Matthew Christenson spoke on the company's belief in listening to the customer's needs to determine "what they really want from their air medical solution."

Life Flight Network liked the Bell 429's interior, but wanted to add customizations that included a single Pivot Stretcher, forward medical cabinet with a liquid oxygen 10-liter orb, medical pivoting seat, ceiling valance, medical lighting and a light weight floor protection kit, according to Christenson.

The additional components will provide a variety of benefits, specifically in the areas of accessibility. The Pivot Stretcher's rotating, extension and locking capabilities allow for a better ease of loading and handling patients in addition to safer patient access in-flight. The cabin will have capacity for up to three medical seats, including a rotating seat with patient access. Medical equipment can be secured by the mounted Stretcher Bridge. For neonatal missions, an Infant Transport Deck can instead be secured to the base deck.

In 2020, Spectrum Aeromed will send the interior kits to Bell, who will perform the installation and delivery of the helicopters to LFN. The Pivot/Articulating Stretcher and base deck, medical swivel seat, and medical mounts are established designs, while the floor adapter attachment is an update to an existing product, according to Christenson. The other items for Spectrum's Bell 429 EMS interior solution are all new designs — but this solution isn't limited to just one helicopter EMS provider or style, according to Christenson.

> // OUR LONG-TERM COMMITMENT TO EACH CUSTOMER ENSURES THEY CAN COMMIT, EVERY DAY, TO SAVING LIVES. //

"[The Bell 429 solution] should hold some nice versatility that others would be able to utilize with no modifications. If they do need modifications, that will also be easy enough to capture and provide with a supplemental type certificate (STC) upgrade," he said.

In addition to LFN's interior solutions, Spectrum Aeromed is currently hard at work on four other STCs that may appeal to operators with different fleet considerations. The current available STC is a Dual-Patient solution for the Leonardo AW139. "This new

design allows an operator to transport two patients and four medical personnel," said Ricky Reno, VP and account executive for Spectrum, allowing "utility, offshore and multi-mission operators the ability to transport up to two patients with no aircraft modifications needed."

The other STCs in development are the Pilatus PC-24 light jet, Embraer Phenom 300 light jet, and Leonardo AW169. While Spectrum has a launch customer for the Pilatus PC-24 light jet project, Spectrum is looking for an aircraft for the Embraer Phenom 300 project. "We have the STC number, and the design and equipment are complete. We are looking for an aircraft to use for the conformity now, so we can finish out the STC process and be ready for a customer." At the end of 2020, Spectrum wants to have its solution for the Leonardo AW169 completed given the growing popularity of the new helicopter.

But Spectrum Aeromed's commitment to its clients looks far beyond 2020. The idea, Christenson said, is "support for life" — a kind of partnership that transcends the life of whatever product or solution the client chooses.

"The relationship we have with each of them will last … hopefully beyond that," Christenson said. "Our long-term commitment to each customer ensures they can commit, every day, to saving lives."

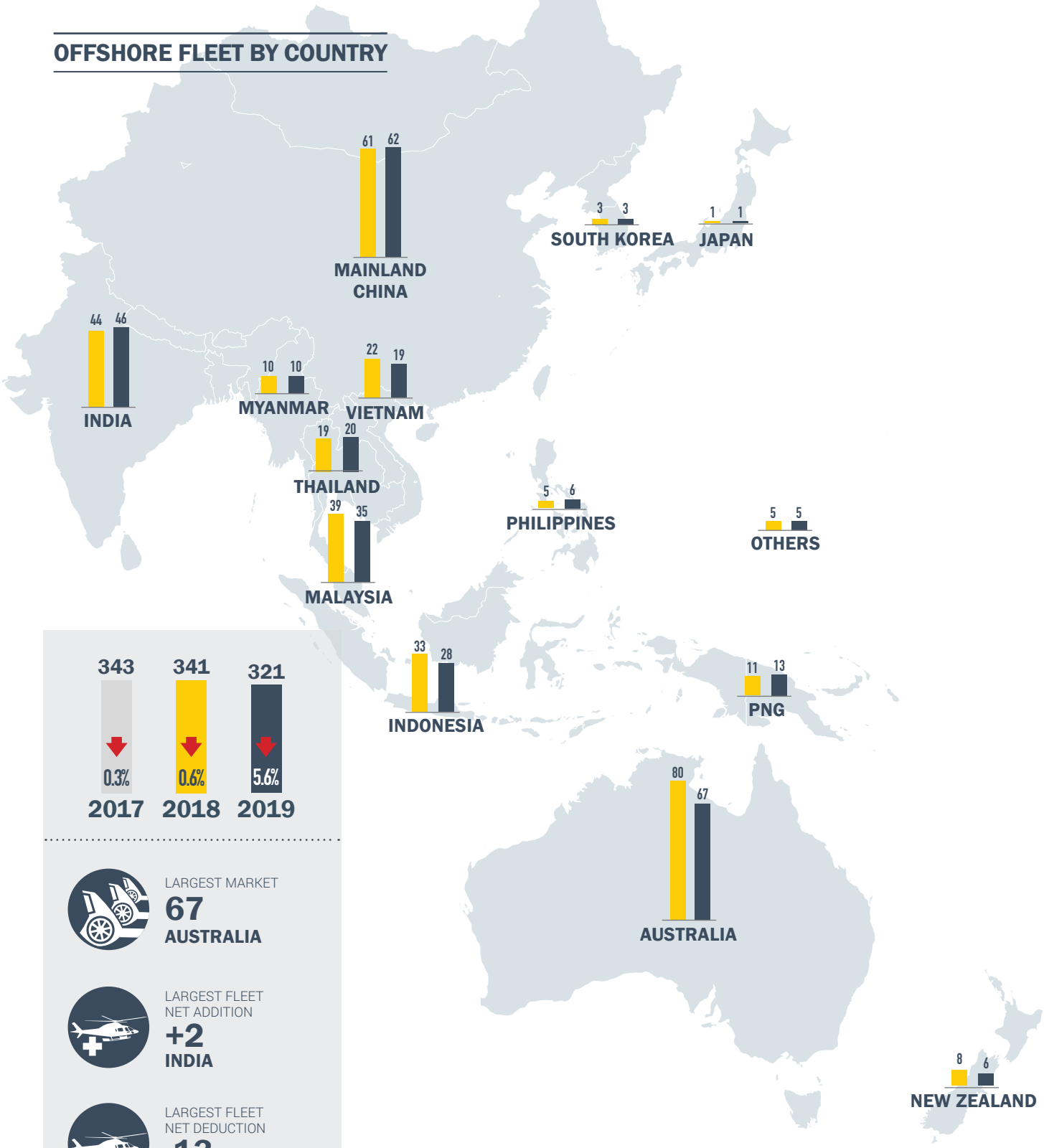
www. spectrum-aeromed.com

SINCE 1991, SPECTRUM AEROMED HAS DESIGNED AND DEVELOPED AIR AMBULANCE MEDICAL INTERIORS FOR HOSPITAL PROGRAMS, MILITARY BRANCHES, MULTI-MISSION CHARTERS AND PRIVATE OPERATORS AROUND THE WORLD, AS WELL AS CUSTOM VIP EMERGENCY MEDICAL INTERIOR SUITES FOR EXECUTIVE AIRCRAFT AND HEADS OF STATE.

SPECTRUM AEROMED'S EXPERIENCED AND PROFESSIONAL PERSONNEL ARE DEDICATED TO PROVIDING CUSTOMIZED SOLUTIONS THAT WILL ENHANCE THE CAPABILITIES OF YOUR AIR MEDICAL AND PATIENT TRANSPORT CREWS. CONTACT US TODAY TO SEE HOW WE SUPPORT LIFE.

MARKET UPDATE:
OFFSHORE MARKET

OFFSHORE FLEET BY COUNTRY



2017	2018	2019
343	341	321
0.3%	0.6%	5.6%

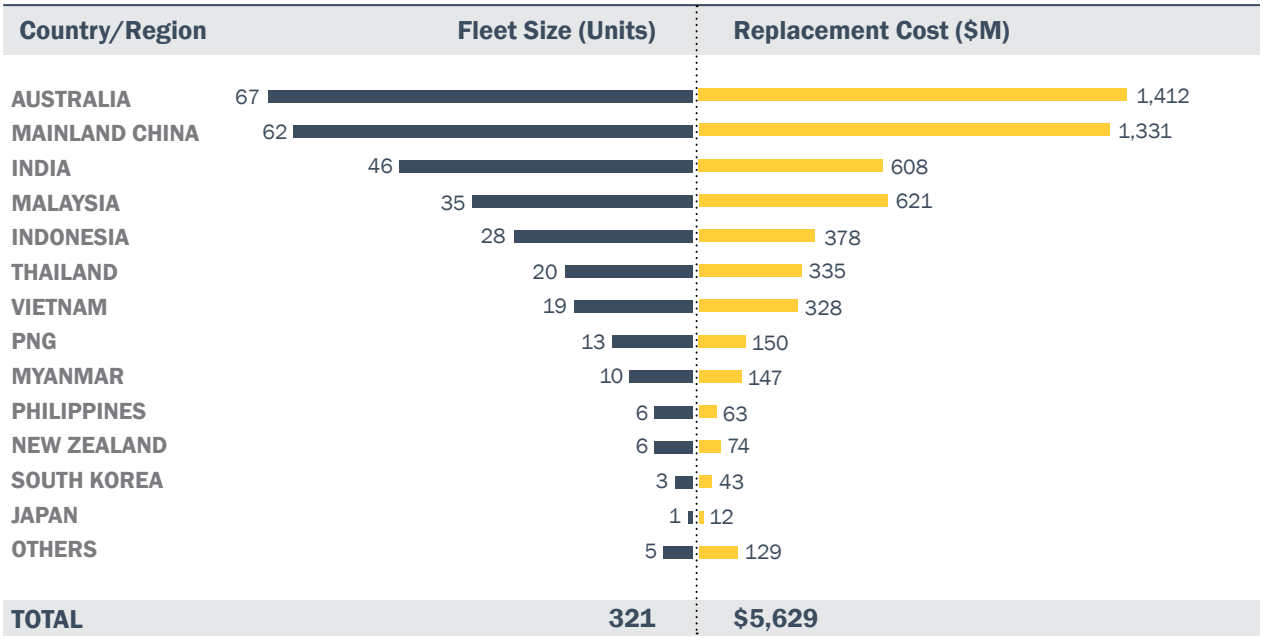
LARGEST MARKET
67
AUSTRALIA

LARGEST FLEET NET ADDITION
+2
INDIA

LARGEST FLEET NET DEDUCTION
-13
AUSTRALIA

THERE WERE 321 CIVIL TURBINE HELICOPTERS DEDICATED FOR OFFSHORE OPERATIONS IN THE ASIA-PACIFIC REGION AT YEAR END 2019. THE OFFSHORE FLEET MAKES UP ONLY AROUND 7% OF THE TOTAL CIVIL TURBINE HELICOPTER FLEET IN TERMS OF UNITS, HOWEVER, IT REPRESENTS NEARLY 18% OF THE TOTAL FLEET IN TERMS OF REPLACEMENT COST.

OFFSHORE FLEET REGIONAL DISTRIBUTION



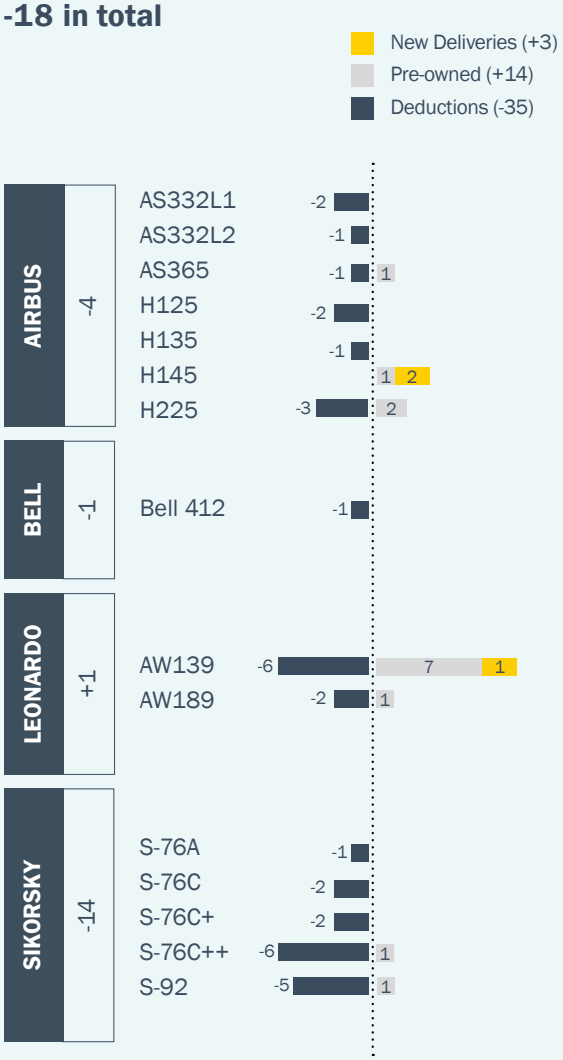
Note (1): 'Replacement Cost' figures are based on the assumption that all existing helicopters would be replaced by the latest versions of their particular OEM variant and at 2019 list price.

Coming into 2019, the O&G market had just witnessed a few major shakeups — the bankruptcy filing of Waypoint Helicopters, later acquired by the Macquarie Group, as well as similar filings and restructurings in 2019 by US-based operator PHI and Bristow Group. These restructurings have seemingly reflected the overall O&G market, which is struggling amid the ongoing downturn in O&G and overcapacity of heavy helicopters — translating to a competitive environment for operators, leasing companies and OEMs.

The result of a challenging environment in 2019 was a significant reduction in the Asia-Pacific offshore fleet, reducing by 20 units overall since year end 2018; attributed to three new deliveries, 14 pre-owned additions, two net mission changes from offshore and 35 deductions. Australia accounted for the largest offshore fleet deduction in 2019 (13), attributed primarily to the out-of-region relocation of several units.

Additions and Deductions by Model

-18 in total



Note: Mission changes are not reflected in the graph above.

Airbus and Sikorsky remain the most popular OEM models in terms of market share, with a fleet of 119 helicopters (37% market share) and 87 helicopters (27% market share), respectively. Leonardo came in third, with a fleet of 80 helicopters (25% market share), followed by Bell, with a fleet of 27 helicopters (8% market share).

With a total of 65 helicopters, the Leonardo AW139 is the single most popular turbine helicopter model used for offshore operations in the region. The Sikorsky S-92 and Airbus AS365 are the second and third most popular offshore models, with 35 and 32 helicopters, respectively.

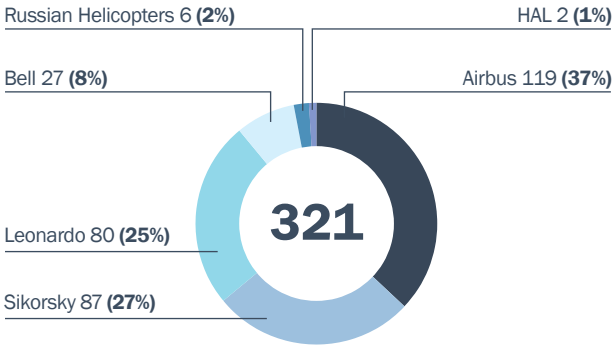
Australia, despite experiencing the largest net reduction of offshore fleet in the region, is home to the largest fleet of offshore helicopters - with 67 helicopters (around 21% of the region's total). Mainland China and India come in second and third, with 62 (around 19%) and 46 helicopters (around 14%), respectively.

With a fleet of 39 helicopters, Citic Offshore Helicopter Co. (COHC), operating out of Mainland China, remains the operator with the largest offshore fleet in the region. Malaysia-based Weststar has the second largest fleet with 20 helicopters; closely followed by Pawan Hans (based in India), operating a fleet of 17 helicopters.

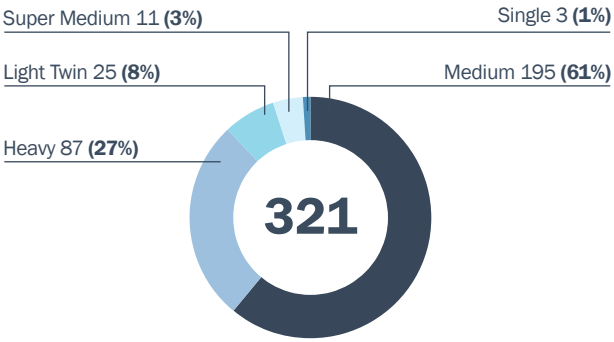
Although the O&G market picked up at the beginning of 2019, oil prices witnessed a dramatic decrease after the first quarter, partly on account of a record-high production of shale oil in the US, leading to an over-supply in the market. Additionally, the escalating tensions due to the ongoing trade war between the US and China threatened global economic growth, leading to a lower demand and thus lowering the price for oil.

With the global economic outlook for 2020 seeming bleak, oil prices are not expected to rise significantly. Even if the Organization of the Petroleum Exporting Countries (OPEC) manages to reduce the production of oil and control the supply to stimulate demand, the oil prices would only show slow increases. Such uncertainty and skepticism is leading operators to place helicopters in storage or change mission configuration for more profitable operations.

OFFSHORE FLEET BY OEM

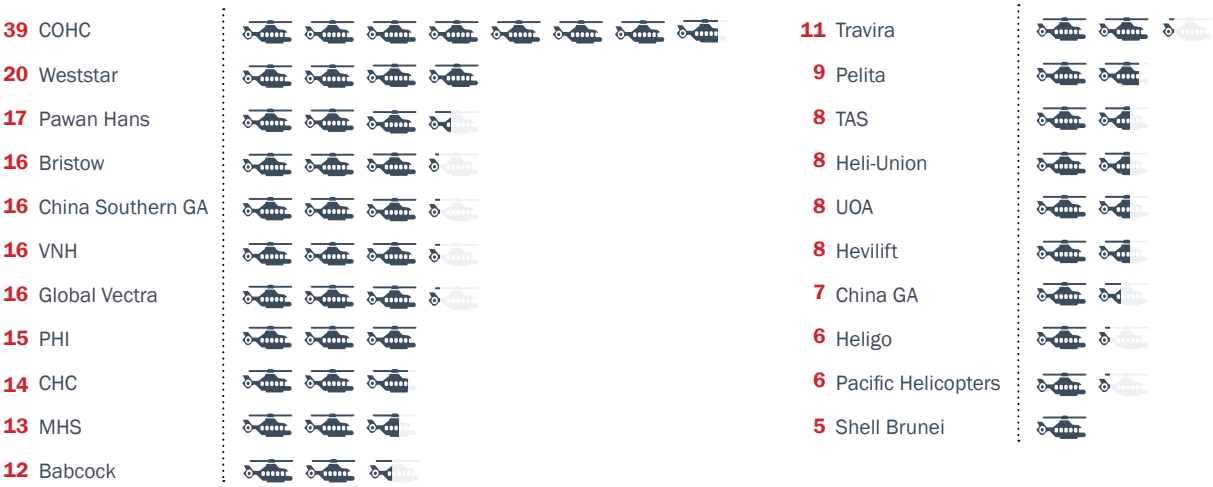


OFFSHORE FLEET BY SIZE CATEGORY



OFFSHORE FLEET BY OPERATOR (5 OR MORE HELICOPTERS)

5 Helicopters



OFFSHORE FLEET BY MODEL AND COUNTRY/REGION

		AUSTRALIA	MAINLAND CHINA	INDIA	MALAYSIA	INDONESIA	THAILAND	VIETNAM	PNG	MYANMAR	NEW ZEALAND	PHILIPPINES	SOUTH KOREA	JAPAN	OTHERS	TOTAL
AIRBUS	AS332L	5	1													6
	AS332L1	2	6													8
	AS332L2				3			3								6
	AS355				1							2				3
	AS365	3	2	21		3				2		1				32
	BK117	1				1			3							5
	H120			1												1
	H125	1														1
	H135	2										1				3
	H145	3							4							7
	H155		14	1				4								19
	H175	2														2
	H225	7	10		5			4								26
SIKORSKY	S-76A					2										2
	S-76A+												1			1
	S-76C				4					1						5
	S-76C+		2			1	3						2			8
	S-76C++	1	11		3	10	1		1	4						31
	S-76D						5									5
	S-92	17	13				2								3	35
LEONARDO	AW109	3	2								1					6
	AW139	16	1	7	14	5	9		2	3	4	2			2	65
	AW189	2			5			2								9
BELL	Bell 205										1					1
	Bell 212								3							3
	Bell 214	1														1
	Bell 412	1		14		4								1		20
	Bell 429					1										1
	Bell 430					1										1
RUSSIAN HELICOPTERS	Mi-171							3								3
	Mi-8							3								3
OTHERS	Dhruv			2												2
	Total	**67**	**62**	**46**	**35**	**28**	**20**	**19**	**13**	**10**	**6**	**6**	**3**	**1**	**5**	**321**

INAEC

AVIATION CORP

INAEC was the first Filipino-owned private airline in the Philippines.

INAEC is the country's leader in the air transport and air charter industry, working with the biggest offshore oil and gas producers, medical service providers, **high value cargo movers**, news and events broadcasters, local and foreign companies, and VVIPs.

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SUPPORT FOR EVERY STAGE OF HELICOPTER OWNERSHIP

JET SUPPORT SERVICES, INC. (JSSI)

FOR MORE THAN 30 YEARS, JET SUPPORT SERVICES, INC. (JSSI), HAS BEEN THE LEADING INDEPENDENT PROVIDER OF MAINTENANCE SUPPORT AND FINANCIAL SERVICES TO THE AVIATION INDUSTRY. THE COMPANY COVERS VIRTUALLY ALL MAKES AND MODELS OF AIRCRAFT, ENGINES AND APUS.

Responsible for maintaining in excess of 2,000 business and regional jets and helicopters around the world, JSSI manages close to 10,000 maintenance events per year through a worldwide infrastructure of more than 70 certified technical advisors. As the company continues to explore new opportunities to leverage this extensive background of technical knowledge and experience, it is fast becoming a dynamic aviation solutions provider and an invaluable resource to owners and operators of helicopters worldwide.

Over the past several months, JSSI has delivered a new level of market intelligence to the business aviation community via a series of strategic acquisitions and the introduction of entirely new financial tools, programs and aircraft consulting services to support the full helicopter life cycle. Today, the JSSI family of companies provides everything from acquisition advice and maintenance programs to parts, leasing and software solutions.

STABILIZING MAINTENANCE BUDGETS

An hourly cost maintenance program from JSSI represents a financial planning tool, not just a maintenance tool. By stabilizing a helicopter's maintenance budget, these flexible and transferable programs allow owners and operators to accurately predict their maintenance budget, year after year.

JSSI secures costs for maintenance services at a level that an individual operator could never achieve, all while assuming the financial risks for any unscheduled maintenance event that may happen to an enrolled asset. No matter what the aircraft or engine combination, JSSI can shop around its vast global network to secure the very best service and rates for clients.

> "AN HOURLY COST MAINTENANCE PROGRAM FROM JSSI REPRESENTS A FINANCIAL PLANNING TOOL, NOT JUST A MAINTENANCE TOOL."

Preparing for major scheduled maintenance events is complex and involves many more details beyond having the funds accrued for when the event is due. JSSI's network of strategically located technical advisors become the client's advocate during these major events, providing an extension of their maintenance department and taking care of many of the preparation details.

The technical and client service teams also stand ready to solve the most challenging AOG problems for clients and always provide easy access to JSSI representatives, anytime and anywhere in the world.

INSPECTING AND APPRAISING AIRCRAFT

JSSI Advisory Services utilizes JSSI's technical expertise and global network to provide a complete range of aircraft consulting services, from ASA-certified appraisals and technical advice to maintenance event management, invoice audits, and aircraft inspections.

As an independent company with a global footprint, JSSI Advisory Services is uniquely positioned to provide clients with consistent, professional, and cost-effective solutions for virtually all makes and models of helicopter. The team is equipped to quickly and reliably inspect any aircraft. In fact, all technical advisors hold A&P, AMT or AME licenses and regularly inspect most makes and models of business aircraft as part of the enrollment process for JSSI programs.

DELIVERING PARTS SOLUTIONS

JSSI Parts & Leasing is ready to meet even the toughest aircraft parts or leasing request. Powered by JSSI, one of the largest purchasers of aircraft parts and maintenance services in the business, JSSI Parts & Leasing is a one-stop shop for parts and supply chain solutions.

SERVICES INCLUDE SOURCING AND ACQUIRING PARTS, LEASING ENGINES AND APUS, ASSISTING WITH CUSTOMS AND FREIGHT MANAGEMENT, AND ARRANGING FOR LOANER ENGINES DURING AN OVERHAUL OR REPAIR. From a single bolt to a complete engine, customers gain access to a vast inventory of aircraft parts, engines and APUs and a global vendor network to source assets for anything that flies.

From its dedicated parts warehouse facility, JSSI Parts & Leasing stocks inventory and provides parts to support the day-to-day operational requirements for hundreds of customers around the world, including JSSI. The extensive pricing knowledge and buying power JSSI Parts & Leasing brings to market drives down parts acquisition costs and ultimately secures significant savings for clients.

HELPING OWNERS MAKE MORE INFORMED DECISIONS

Following the 2018 acquisition of aviation data specialists Conklin & de Decker, JSSI has since implemented a series of product advancements that streamline access to the most trusted aircraft comparison data available. For over 35 years, Conklin & de Decker has been a leader in aviation research, consulting and education with a mission to help owners make more informed decisions when dealing with the purchase, operation and disposition of aircraft.

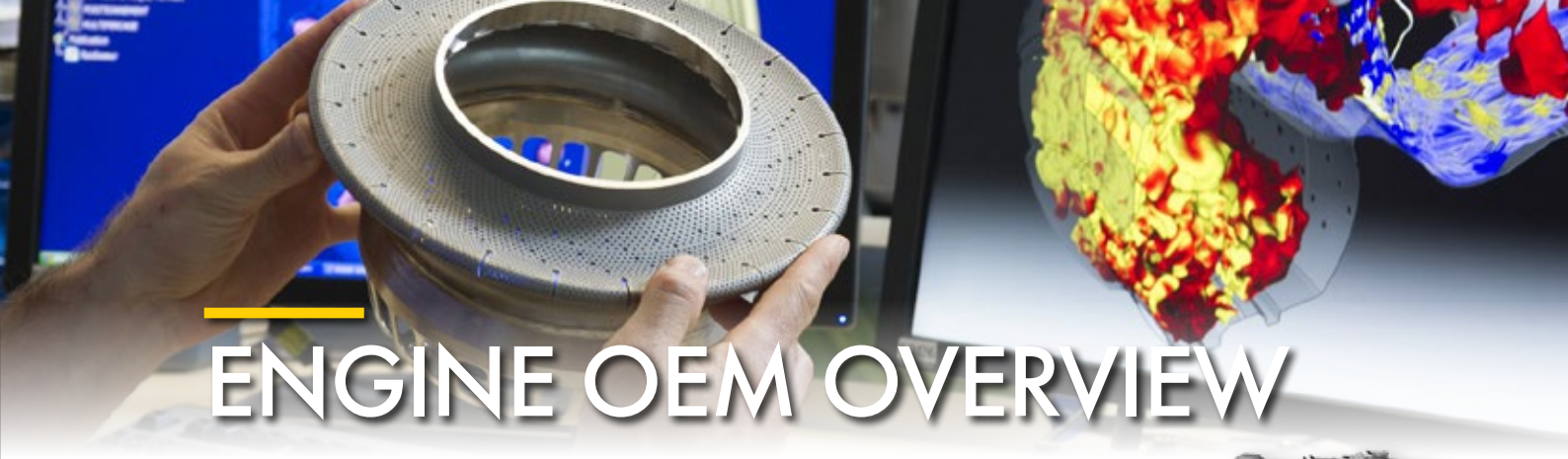
The recent launch of the company's next-gen aircraft comparison tool, the Conklin & de Decker Report, represents a significant leap forward in technology-driven advances and combines decades of experience and data in one interactive aircraft comparison report. Users can compare and evaluate fixed and variable costs and review more detailed performance and specification data than ever before for more than 500 jets, turboprops, helicopters and piston aircraft. Additionally, an innovative new free mobile app allows costs to be customized for multiple aircraft, dimensions to be compared using visual overlays, and much more.

STREAMLINING BUSINESS PROCESSES

In 2019, JSSI announced the acquisition of MRO software specialist Tracware to further enhance its growing suite of technology-enabled services. An innovative developer and global provider of aviation process control software, Tracware brings a comprehensive understanding of the specific processes and requirements MRO businesses need to thrive operationally.

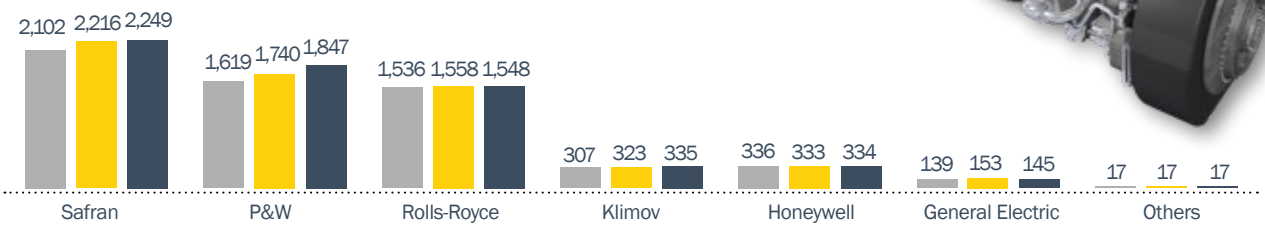
Tracware's flagship Aerotrac software is a functionally rich, off-the-shelf software solution specifically designed to align and manage the unique business processes and workflow needs of aviation MRO organizations of all sizes. The software has evolved significantly since its first iteration in 1999 with the ongoing collaboration and input of customers worldwide. Today, it provides a 360-degree view of all MRO functions and enables users, including third-party MRO providers, OEMs and those managing their own aircraft fleet, to take control of MRO business processes in one innovative application.

To find out more about the JSSI family of companies, visit: **jetsupport.com**



ENGINE OEM OVERVIEW

TOTAL ENGINE GROWTH

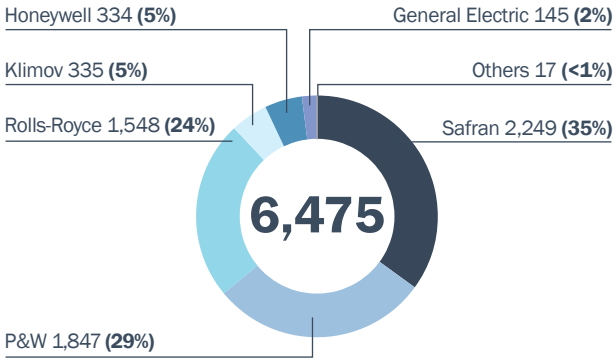


There was a total of 6,475 turbo-shaft engines powering the fleet of 4,373 helicopters in the Asia-Pacific region at year end 2019. Safran Engines was the market leader, with 2,249 engines (35% of total), followed by Pratt & Whitney and Rolls-Royce, with 1,847 (29% of total) and 1,548 (24% of total) engines respectively. Pratt & Whitney witnessed the largest growth in the region, increasing its coverage to 1,847 engines (growing by around 6%).

Nearly 46% and 31% of the helicopters powered by Safran engines belong to the single and medium-sized categories, while the majority of the demand for Rolls-Royce engines was for single-engine helicopters — 73%.

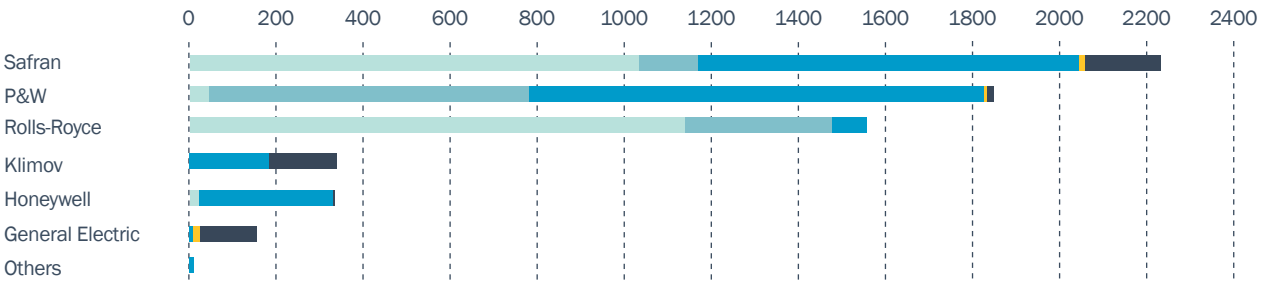
Safran's Arriel family is the most popular engine model in Asia Pacific, with 1,204 helicopter units using 1,620 engines. Rolls-Royce's Allison 250 comes in second, with 1,235 helicopter units using 1,441 engines. With 534 helicopter units using 1,011 engines, PT6 is Pratt & Whitney's most popular engine family in the region. Airbus 125 (720 units), Bell 206 (529 units) and AW139 (238 units) are the most popular turbine helicopters in the region that use the Arriel, Allison 250 and PT6 engines, respectively.

ENGINE OEM MARKET SHARE



The helicopter engine market in the region has shown continuous yearly growth since year end 2015. The market has grown 2.1% year-on-year increasing by 135 units from 6,340 engines in 2018 and is expected to grow in the coming years as the civil turbine helicopter fleet in Asia Pacific continues to grow.

ENGINE BY SIZE CATEGORY



PRODUCT SPOTLIGHT:

SAFRAN ANETO-1K: PUSHING THE LIMITS HIGHER

SAFRAN HELICOPTER ENGINES

SAFRAN HELICOPTER ENGINES RECENTLY RECEIVED THE EASA (EUROPEAN AVIATION SAFETY AGENCY) TYPE CERTIFICATE FOR ITS ANETO-1K ENGINE FITTED ON THE LEONARDO AW189K. **MANAGING DIRECTOR OF SAFRAN HELICOPTER ENGINES ASIA, HERVE PASBECQ SPOKE WITH ASG ON THE CERTIFICATION.**

HOW IS THIS CERTIFICATION A MAJOR MILESTONE FOR SAFRAN?

It reflects the excellent performance demonstrated by the engine during its development phase. After an intensive and rigorous test campaign of more than 5,000 hours, on the ground and in-flight, the Aneto-1K is now ready to support the AW189K entry-into-service.

WHAT IS SAFRAN ABLE TO ACHIEVE WITH THE ANETO-1K?

In a few words: unparalleled capability, responsiveness & reduced maintenance workload. The Aneto-1K in-flight behavior has been unanimously praised.

The Aneto is at the forefront in terms of reliability and safety. Maintenance is optimized with fewer scheduled tasks and longer service intervals. Users will also benefit from connected features such as Health Monitoring (digital service for predictive maintenance) and full compatibility with BOOST, Safran's new online engine configuration and maintenance management service.

CAN YOU GIVE TO THE READERS A SNEAK PEEK TO THE ADVANCED TECHNOLOGIES USED FOR THIS ENGINE?

The Aneto family is the perfect balance between new and proven technologies:

- Inlet Particles Separator for an enhanced engine protection
- Latest-generation dual-channel FADEC for increased operability & reduced pilot workload
- Reverse-Flow combustion chamber for fast start & reduced weight
- High Pressure Turbine featuring advanced materials for high engine performances
- Compressor with Inlet Guide Vanes for fast acceleration

To produce the Aneto-1K, Safran Helicopter Engines is using modern industrial technologies such as additive manufacturing and is compliant with the European Union regulation on chemical products (REACH).

WHAT ARE THE BENEFITS FOR THE AW189K OPERATORS?

Enhanced safety and reactivity for a wider operating envelope. Intended for super-medium and heavy helicopters, the Aneto family produces between 2,500 and 3,000 shp. The 1K demonstrated excellent performance and reliability. Thanks to an exceptional power-to-volume ratio, it delivers 25% more thermal power (compared with existing models), resulting in increased mission capabilities. This will be especially useful in demanding roles such as: offshore transport, search & rescue, fire-fighting, law enforcement or military transport.

KEY MILESTONES TOWARDS NEW HEIGHTS

MARCH 2017
Maiden flight with the Leonardo AW189K

DECEMBER 2019
Aneto-1K EASA
Type Certificate received

MID-2020
AW189K Entry into service

SAFRAN POWERPACK®: THE BEST DMC ON THE MARKET

The PowerPack® is a new SBH® (Support By the Hour) package to maintain the 2x Aneto-1K engines & the auxiliary power unit eAPU60:

- A comprehensive support package
- Optimized maintenance cost
- A single contract with a unique focal point
- Proximity support for availability through a worldwide network

For more information: www.safran-helicopter-engines.com

POWER PACK®

2 ANETO-1K + 1 eAPU60

HELICOPTER OEM OVERVIEW

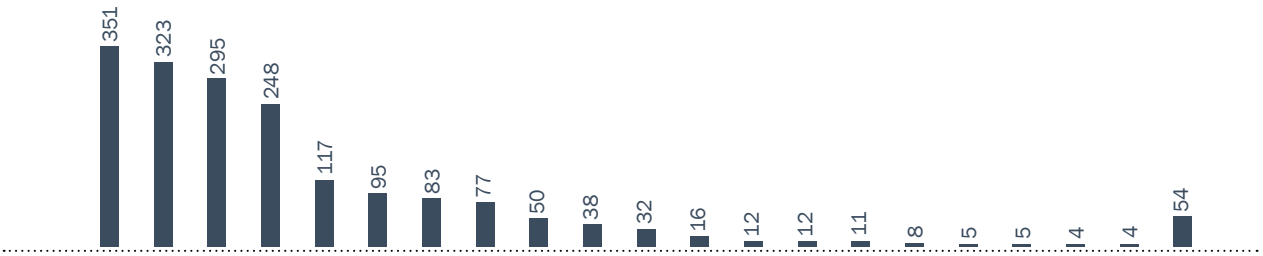
AIRBUS

RANKING
No.1

GROWTH
19 ↑ 1.0% ↑

MOST POPULAR
H125

LARGEST FLEET
Japan

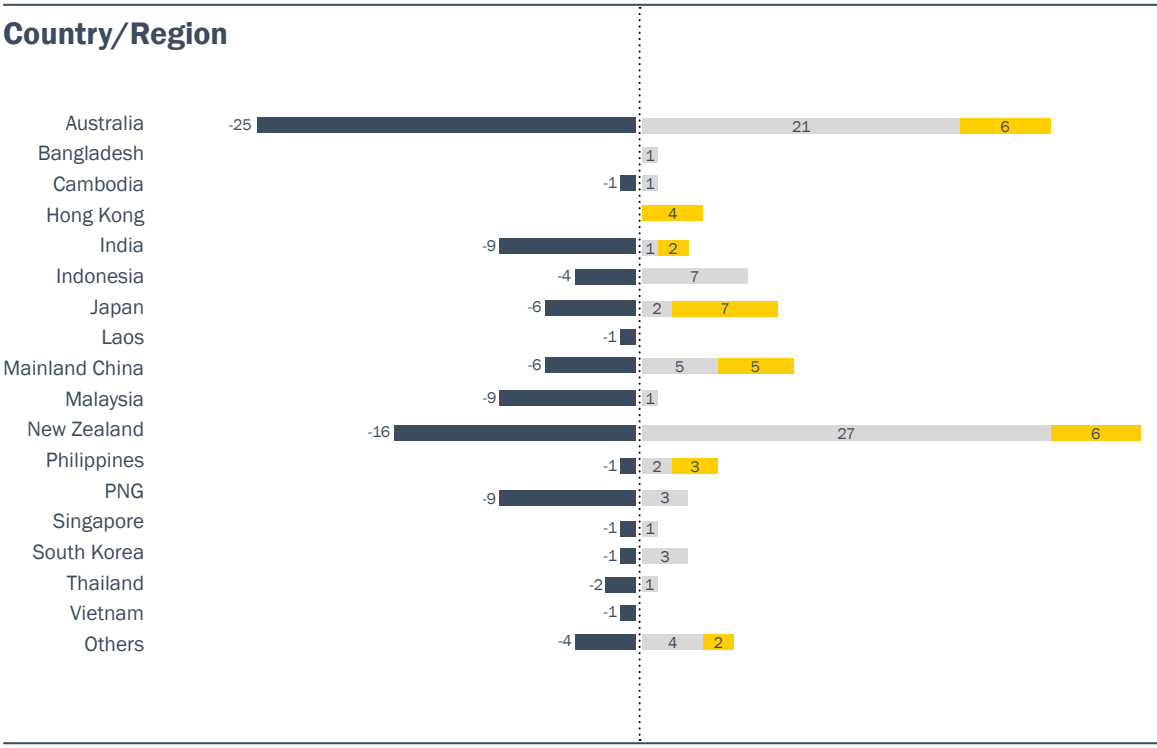


	JAPAN	AUSTRALIA	NEW ZEALAND	MAINLAND CHINA	INDIA	PHILIPPINES	INDONESIA	MALAYSIA	SOUTH KOREA	PNG	THAILAND	HONG KONG	CAMBODIA	VIETNAM	TAIWAN	MYANMAR	SRI LANKA	LAOS	SINGAPORE	BANGLADESH	OTHERS	TOTAL
AS332C							1															1
AS332L	3	5		2																		10
AS332L1	9	2		8			3															22
AS332L2	1							3				3		3								10
AS355	25	18	15		4	7		19	1				2								4	95
AS365	50	15		5	39	4	9	12	12		2		1		9	2					1	161
BK117	32	22	34				4		9	15					2							118
B0105	1	14	8			10	26	8	5	6											3	81
H120	4	23	20	15	2			11				1				1		1	2		1	81
H125	88	161	179	128	23	34	18	5	16	9	11		5			5	3	2	1		39	727
H130	7	32	29	16	6	23	5				3		2	1				2	1	4	2	133
H135	77	14	1	29	6	4	4	9	1		3	1	2								2	153
H145	38	6	7	3	3	7	5		1	7	4										2	83
H155	5	1		22	2	3	5	5	2		7	4		4			2					62
H175		2									2	7										11
H215				1																		1
H225	11	7		19				5	3					4								49
SA313						2																2
SA315			2		3		3			1												9
SA316					25																	25
SA319					4																	4
SA341		1				1																2
Total	**351**	**323**	**295**	**248**	**117**	**95**	**83**	**77**	**50**	**38**	**32**	**16**	**12**	**12**	**11**	**8**	**5**	**5**	**4**	**4**	**54**	**1,840**

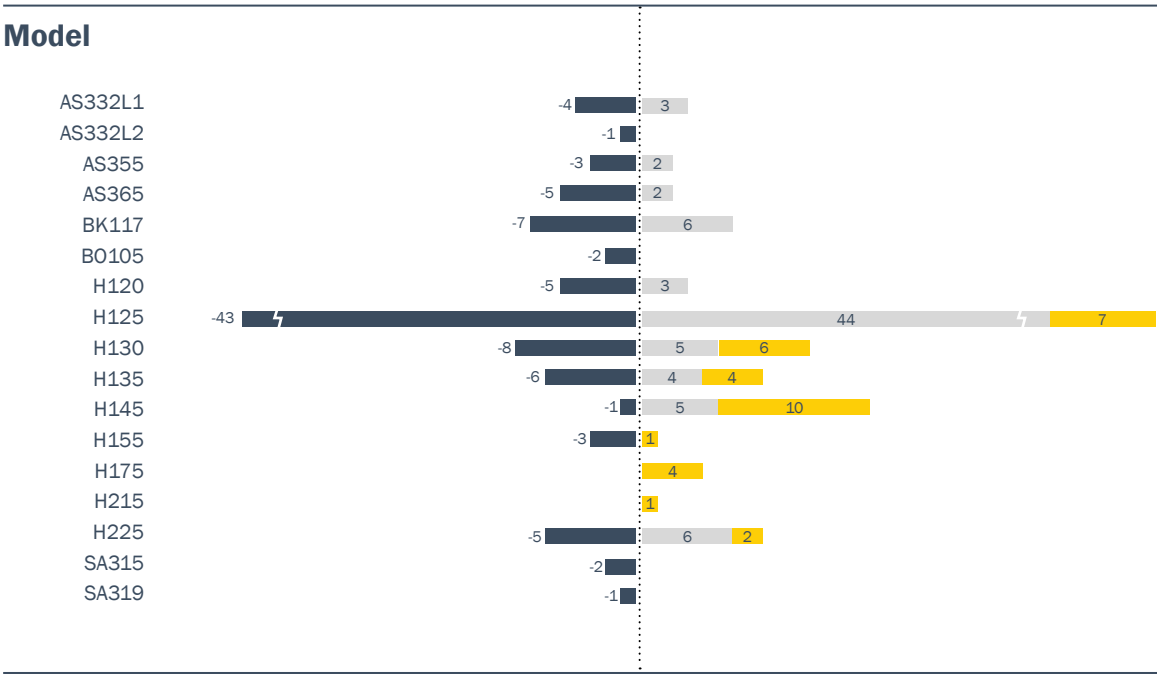
ADDITIONS AND DEDUCTIONS (AIRBUS)

New Deliveries (+35) | Pre-owned (+80) | Deductions (-96)

Country/Region



Model



Note: Include movements between countries in APAC.

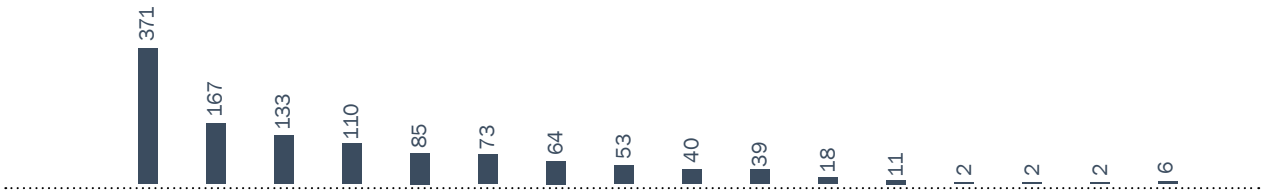
BELL

RANKING **No.2**

GROWTH **30 ↑ 2.6% ↑**

MOST POPULAR **Bell 206**

LARGEST FLEET **Australia**

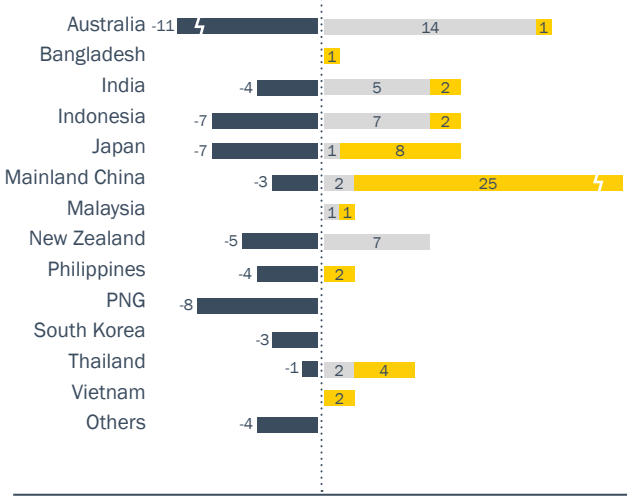


	AUSTRALIA	MAINLAND CHINA	JAPAN	NEW ZEALAND	INDIA	INDONESIA	THAILAND	PNG	SOUTH KOREA	PHILIPPINES	MALAYSIA	BANGLADESH	TAIWAN	VIETNAM	CAMBODIA	OTHERS	TOTAL
Bell 204	5		7	1													13
Bell 205	21		1	7			7		1								37
Bell 206	255	42	27	87	18	18	18	8	21	18	13				2	2	529
Bell 212	15	1				5	10	15								1	47
Bell 214	10							3	6								19
Bell 214ST	1								1								2
Bell 222	5			1				1			1						8
Bell 230	1				2				1			1					5
Bell 407	7	88	5		25	11	3	21	2	2	2	7				3	176
Bell 412	32	3	53		27	25	18	4	6	6							174
Bell 427	6	1	6	2	2	2				1							20
Bell 429	4	17	6	7	9	11	8			7	1	2					72
Bell 430			12		1	1		1	2	2		1					20
Bell 505	7	15	16	5	1					3	1		2	2			52
Bell AH-1	2																2
Total	**371**	**167**	**133**	**110**	**85**	**73**	**64**	**53**	**40**	**39**	**18**	**11**	**2**	**2**	**2**	**6**	**1,176**

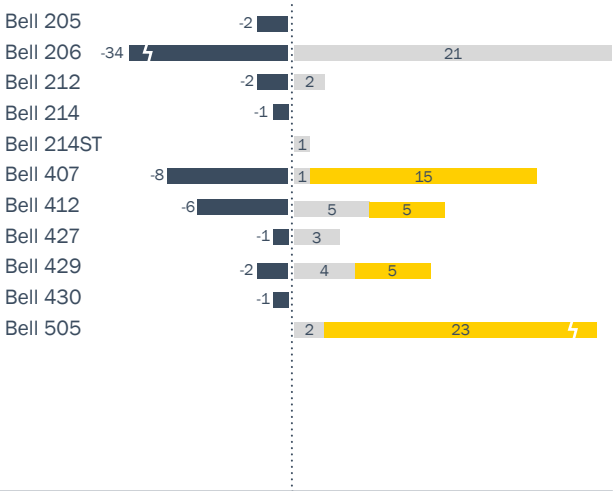
ADDITIONS AND DEDUCTIONS

New Deliveries (+48) | Pre-owned (+39) | Deductions (-57)

Country/Region



Model



Note: Include movements between countries in APAC.

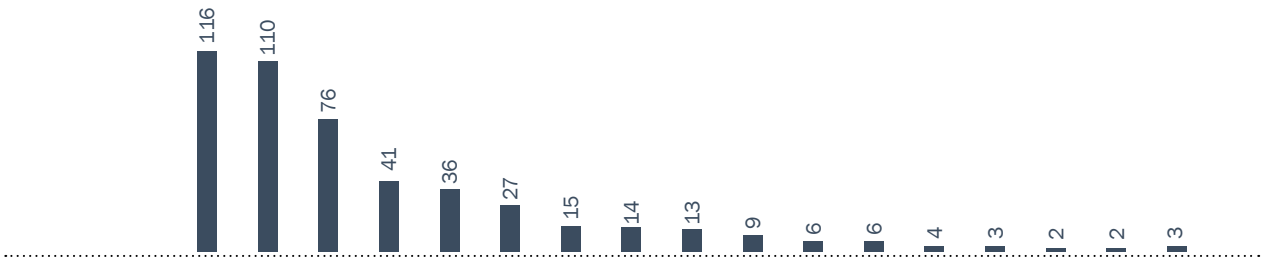
LEONARDO

RANKING **No.3**

GROWTH **34 ↑ 7.6% ↑**

MOST POPULAR **AW139**

LARGEST FLEET **Japan**

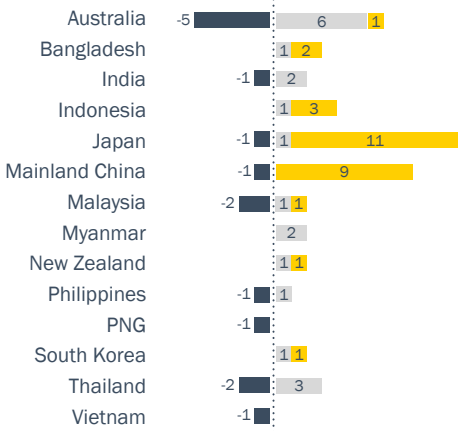


	JAPAN	MAINLAND CHINA	AUSTRALIA	INDIA	MALAYSIA	SOUTH KOREA	INDONESIA	PHILIPPINES	NEW ZEALAND	THAILAND	MACAU	MYANMAR	BANGLADESH	TAIWAN	VIETNAM	PNG	OTHERS	TOTAL
AH.1									2									2
AW109	51	30	18	24	3	7	2	5	4				1				1	146
AW119	1	40	3	4	1	1	2	3	1				3					59
AW139	61	35	52	11	25	12	8	5	4	9	6	6				2	2	238
AW169	3	1	1	2		5	3	1	2					3				21
AW189			2		7	1									2			12
SW-4		4				1												5
Total	**116**	**110**	**76**	**41**	**36**	**27**	**15**	**14**	**13**	**9**	**6**	**6**	**4**	**3**	**2**	**2**	**3**	**483**

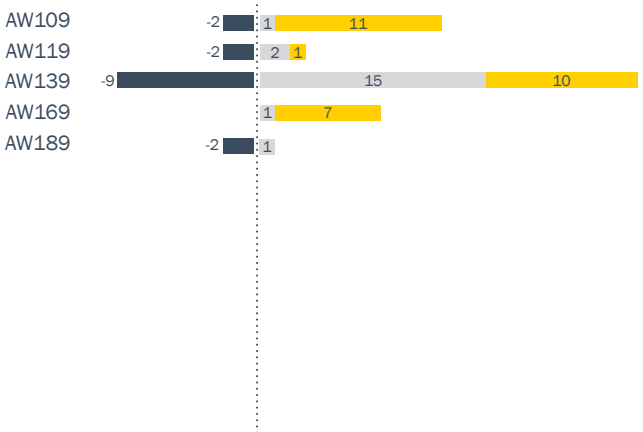
ADDITIONS AND DEDUCTIONS

New Deliveries (+29) | Pre-owned (+20) | Deductions (-15)

Country/Region



Model



Note: Include movements between countries in APAC.

MD

RANKING **No.4**

GROWTH **-3 -1.2%**

MOST POPULAR **MD 500**

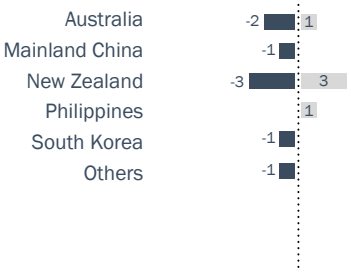
LARGEST FLEET **New Zealand**

	NEW ZEALAND	AUSTRALIA	JAPAN	PHILIPPINES	SOUTH KOREA	HONG KONG	INDONESIA	MAINLAND CHINA	INDIA	OTHERS	TOTAL
MD 500	77	16	3	7	5	1	4			66	179
MD 520	21	4		1	1	1		1	1		30
MD 530	4	1									5
MD 600	1	1	1	2				1			6
MD 900	2		11	3		3		1	2		22
Total	**105**	**22**	**15**	**13**	**6**	**5**	**4**	**3**	**3**	**66**	**242**

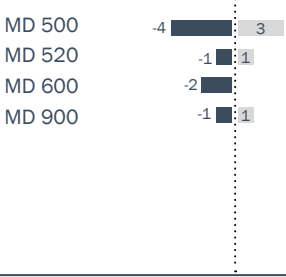
ADDITIONS AND DEDUCTIONS

New Deliveries (-) | Pre-owned (+5) | Deductions (-8)

Country/Region



Model



Note: Include movements between countries in APAC.

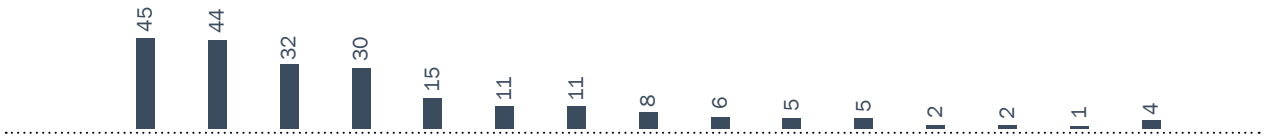
SIKORSKY

RANKING **No.5**

GROWTH **-13 -5.6%**

MOST POPULAR **S-76C++**

LARGEST FLEET **Mainland China**

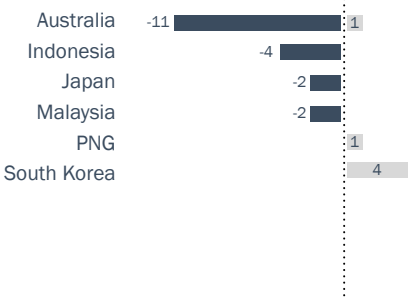


	MAINLAND CHINA	SOUTH KOREA	JAPAN	AUSTRALIA	INDONESIA	THAILAND	MALAYSIA	TAIWAN	INDIA	MYANMAR	NEW ZEALAND	PNG	PHILIPPINES	SINGAPORE	OTHERS	TOTAL
S-330				1					1				1			3
S-333	1		1	1												3
S-58		3														3
S-61		7												1		8
S-64		5														5
S-70A															1	1
S-76A	1	2	1	1	2						3	1	1			12
S-76A+		1	1	5												7
S-76A++		5		1												6
S-76B		6	1	2			1									10
S-76C		1	3				4			1						9
S-76C+	6	7	5	1	3	3	1									26
S-76C++	16	2	4	1	10	1	5		5	4	2	1				51
S-76D	8	3	15			5										31
S-92	13	2	1	17		2									3	38
UH-60								8								8
Total	**45**	**44**	**32**	**30**	**15**	**11**	**11**	**8**	**6**	**5**	**5**	**2**	**2**	**1**	**4**	**221**

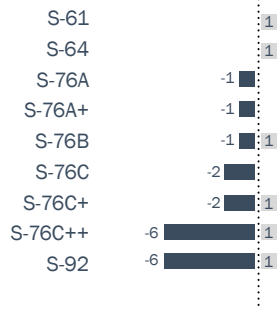
ADDITIONS AND DEDUCTIONS

New Deliveries (-) | Pre-owned (+6) | Deductions (-19)

Country/Region



Model



Note: Include movements between countries in APAC.

RUSSIAN HELICOPTERS

RANKING **No.6**

MOST POPULAR **KA-32**

GROWTH **6 ↑ 3.8% ↑**

LARGEST FLEET **South Korea**

	SOUTH KOREA	MAINLAND CHINA	VIETNAM	INDONESIA	INDIA	PNG	MALAYSIA	SRI LANKA	THAILAND	JAPAN	LAOS	NEW ZEALAND	OTHERS	TOTAL
KA-32	49	21		2					2	1				75
Mi-17			2											2
Mi-171		21	3											24
Mi-2	10			6										16
Mi-26		4												4
Mi-34												1		1
Mi-8	3	3	9	3	7	5	4	3			1		8	46
Total	**62**	**49**	**14**	**11**	**7**	**5**	**4**	**3**	**2**	**1**	**1**	**1**	**8**	**168**

ROBINSON

RANKING **No.7**

MOST POPULAR **R66**

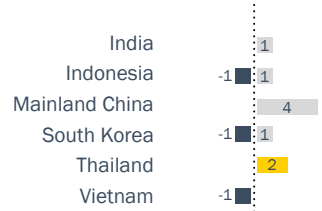
GROWTH **12 ↑ 12.6% ↑**

LARGEST FLEET **Australia**

	AUSTRALIA	MAINLAND CHINA	JAPAN	BANGLADESH	MALAYSIA	NEW ZEALAND	PHILIPPINES	INDONESIA	INDIA	HONG KONG	SRI LANKA	SINGAPORE	OTHERS	TOTAL
R66	30	23	12	12	7	5	4	3	3	2	2	1	3	107
Total	**30**	**23**	**12**	**12**	**7**	**5**	**4**	**3**	**3**	**2**	**2**	**1**	**3**	**107**

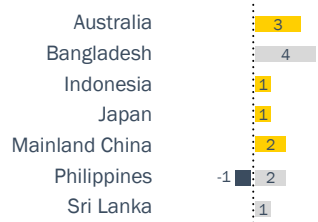
ADDITIONS AND DEDUCTIONS

Country/Region



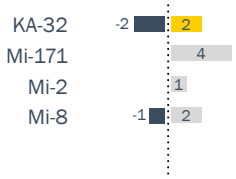
New Deliveries (+2) Pre-owned (+7) Deductions (-3)

Country/Region



New Deliveries (+7) Pre-owned (+7) Deductions (-2)

Model



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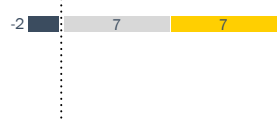


Note: Include movements between countries in APAC.

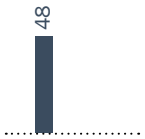
AVICOPTER

RANKING
No.8

MOST POPULAR
AC311

GROWTH
-

LARGEST FLEET
Mainland China



	MAINLAND CHINA	TOTAL
AC311	24	24
AC312	20	20
AC313	4	4
Total	**48**	**48**

ENSTROM

RANKING
No.8

MOST POPULAR
EN480

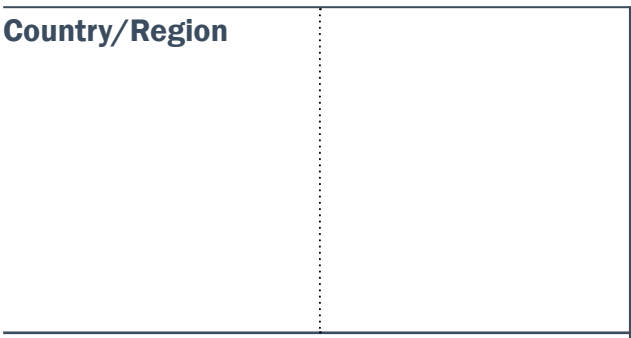
GROWTH
-1 ↓ -2.0% ↓

LARGEST FLEET
Mainland China

	MAINLAND CHINA	INDONESIA	SOUTH KOREA	AUSTRALIA	NEW ZEALAND	JAPAN	PHILIPPINES	TOTAL
EN480	24	17	2	2	1	1	1	48
Total	**24**	**17**	**2**	**2**	**1**	**1**	**1**	**48**

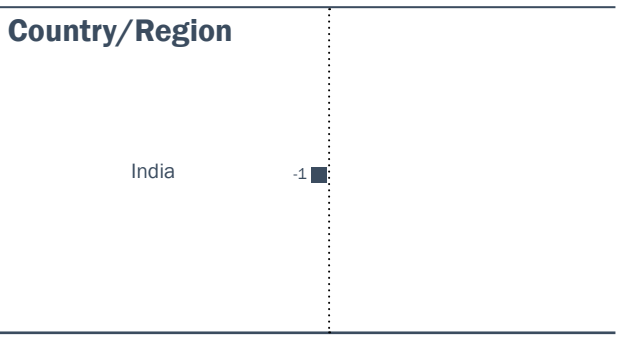
ADDITIONS AND DEDUCTIONS

Country/Region



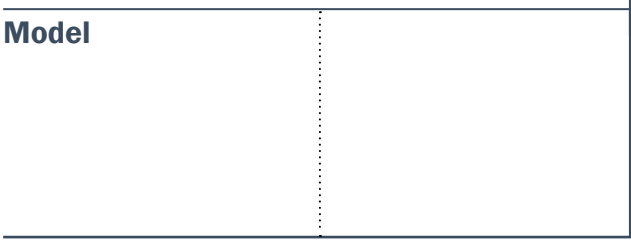
New Deliveries (-) Pre-owned (-) Deductions (-)

Country/Region



New Deliveries (-) Pre-owned (-) Deductions (-1)

Model



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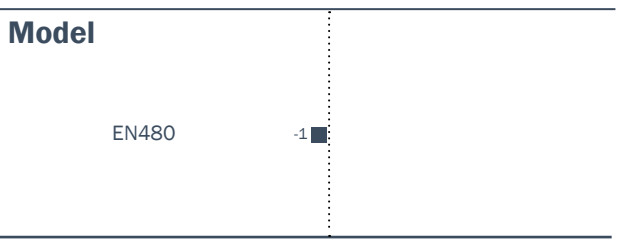

Note: Include movements between countries in APAC.

DIRECTORY:
REGIONAL SERVICE PROVIDERS

ASG's Directory delivers potential customers with a quick and easy way to find the top providers, including contact information and service scope.

MILESTONE AVIATION

Milestone Aviation Group, a GECAS company, is the world's leading helicopter leasing and financing company.

Milestone has a fleet of helicopters worth over US$5 billion plus a loan portfolio of approximately US$300 million.

Milestone partners with helicopter operators worldwide, providing a wide array of financial and productivity solutions, including operating leases, purchase/ leasebacks, secured debt financing, engine leasing and fleet advisory.

The company supports over 45 customers in more than 30 countries serving a variety of industries, including offshore oil and gas, search and rescue, emergency medical services, police surveillance, mining and other utility missions.

Global Headquarters
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Simmonscourt Road
Ballsbridge, Dublin 4, Ireland
+353 1 216 5700
info@milestoneaviation.com

milestoneaviation.com

MILESTONE AVIATION
A GECAS COMPANY

COUNTRY/REGION: AUSTRALIA

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Heli-One.com

EAGLE AUSTRALASIA

COUNTRY/REGION: AUSTRALIA

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Eagle Australasia provide comprehensive helicopter support services from our facilities in Coffs Harbour NSW and Redcliffe QLD, Australia.

We offer heavy maintenance, avionics fit-outs, customisation, component overhaul, composite repair, NDT and paint refinishing at each of our two locations. We also offer 24/7 AOG support to operators from our parts hubs at both locations.

We are a Bell Customer Service Facility and Garmin Authorised Dealer and maintain close relationships with the industry's top manufacturers and suppliers.

Eagle have been providing helicopter sales and leasing solutions to customers for decades and our dedicated staff are committed to give you the best advice when it comes to your helicopter sale or acquisition.

Eagle Australasia - backed by the Eagle Worldwide Fleet Management Group - can provide all the necessary support so you can concentrate on your mission. Contact us to learn how we can best support your operations.

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COUNTRY/REGION: CHINA

金石航空

猎鹰特训
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EMERGENCY RESPONSE: EMS, Urban Operation, Rescue Hoist, etc.

DISASTER RELIEF: Mountain Flying, External Load Operation, Precision External Load, Aerial Delivery, Short Haul, etc.

AERIAL FIREFIGHTING: External Load Operation, Vertical Reference, Mountain Flying, Aerial Firefighting, etc.

AIR TRANSPORT: Aerial Delivery, External Load Operation, Vertical Reference, Mountain Flying, Short Haul, etc.

Falcon Special Mission provides the following equipment and can help clients source other special mission equipment based on the clients' needs:

- Apparel & Equipment for Helicopter Search and Rescue Operation
- Professional Air Crew Gear
- Hoist Operation Equipment
- Rappel/RAD Operation Equipment
- External Load Operation Equipment
- Life Support Equipment

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Website: www.Avionpacific.com | **Email:** Marketing@avionpacific.com | **Tel:** +86 755 26670729

青岛直升机航空有限公司
QINGDAO HELICOPTER AVIATION CO.,LTD

Established in 1993, **QINGDAO HELICOPTER AVIATION CO., LTD.** is headquartered in Qingdao, China. In accordance with the management philosophy of "homogenous aircraft, professional management and dedicated services", the company is specialized in aerial forestry and search and rescue (SAR) services. It is currently operating two Mil Mi-26 TC helicopters and fifteen Mil Mi-171 helicopters. The company operates the largest Mil civil helicopters fleet in Asia.

CONTACT INFO:

Building One Tanxiangwan Mansion
No. 230 Shenzhen Road, Laoshan District
Qingdao City, Shandong Province, P.R. China

T : +86-532-80991039 | F : +86-532-80991038

E : info@qdhelicopter.com
W : www.qdcopter.com

COUNTRY/REGION: INDIA

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Headquartered in Mumbai, Global Vectra Helicorp Limited (GVHL) is the largest private helicopter Company in India, providing seamless, safe and accident free flying for almost two decades.

Publicly listed since 2006, GVHL is quoted on both the National Stock Exchange and the Mumbai Stock Exchange and operates a large, modern fleet of helicopters with our team of highly skilled pilots, engineers and support staff.

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Civil Aerodrome, Juhu Mumbai -400054
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Fax : +91-22-6140 9300
Email : globalhelicorp@gvhl.net
Web : **www.globalhelicorp.com**

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ISO 14001-2015
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THE ROTARY WING SOCIETY OF INDIA Estd.1998

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safety and quality management systems

Global VECTRA helicorp Ltd

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COUNTRY/REGION: NEW ZEALAND

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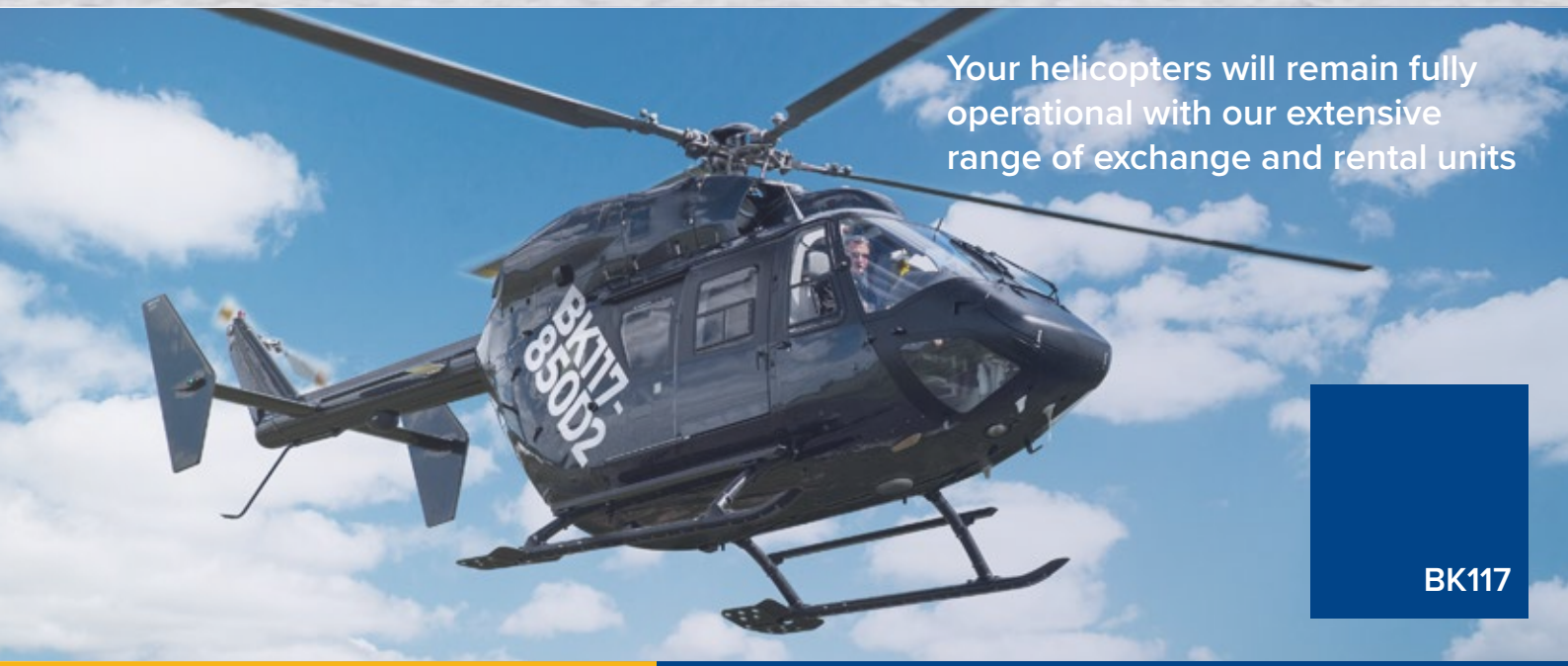
AS350
AS355
EC130



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- Parts & components sales
- Design, certification & manufacturing
- MODs and STCs
- Maintenance Suppport
- Aircraft sales & leasing

COUNTRY/REGION: SOUTH KOREA

HELIKOREA

HELIKOREA CO,. LTD is the largest commercial helicopter operator in Korea with over 20 helicopters in operation. At its headquarters in the central of Deajeon, Heli Korea is located on a 20,000-square-metre site, complete with an authorized heli-pad and maintenance facilities that can accommodate over 20 helicopters. The company also has operations at Gimpo Airport and Gimhae International Airport, as well as in Seoul.

Domestically, Heli Korea operates aircraft for emergency medical services, cargo, firefighting and forestry, aerial filming, offshore service and more. Internationally, it provides VIP services for the likes of the Government of India and the Government of China, as well for the natural gas with Bristow helicopters in Australia.

CONTACT INFO:

E: info@helikorea.co.kr

T: +82-42-633-8900
+82-2-565-8555

W: www.helikorea.co.kr

VIETNAM HELICOPTER CORPORATION (VNH) is the largest helicopter operator in Vietnam with over 30 years of experience, highly valued by its customers for high quality service and strong safety commitment.

With nationwide airports and bases, VNH operates a diverse fleet of 30 modern helicopters for offshore operations, US Missed In Action program, tourism, emergency medical services, search & rescue, VIP transportation, aerial photographing and more. Internationally, VNH provides firefighting services for PT. Komala and PT. National Utility Helicopters (Indonesia), transportation for SkyOne Airways (India) and offshore operations for Weststar Aviation (Malaysia).

Certified as ATO and AMO, VNH also offers Pilot and Technician Training and Helicopter Maintenance services for domestic and international customers.

CONTACT INFO:

Headquarters
172 Truong Chinh Str.,
Dong Da Dstr., Hanoi, Vietnam

T : +84 (24) 3852 5740
F : +84 (24) 3852 1523

E : info@vnh.com.vn
W : www.vnh.com.vn

APPENDIX

REGION BREAKDOWN

EAST ASIA

Japan
South Korea
Mongolia

SOUTHEAST ASIA

Brunei
Cambodia
Indonesia
Laos
Malaysia
Myanmar
Philippines
Singapore
Thailand
Vietnam

GREATER CHINA

Mainland China
Hong Kong
Macau
Taiwan

SOUTH ASIA

Bangladesh
Bhutan
India
Maldives
Nepal
Sri Lanka

OCEANIA

Australia
Fiji
French Polynesia
Guam
New Caledonia
New Zealand
Palau
Papua New Guinea
Solomon Islands
Vanuatu

MISSION CATEGORIES

In this report, mission categories include:

- Multi-Mission
- Offshore Operations
- Search and Rescue (SAR)
- Emergency Medical Service (EMS)
- Law Enforcement
- Flight Training
- Corporate
- Private (recreational)
- Charter

The largest mission category is broadly defined as multi-mission. Most helicopters in this category are active in more than one mission and can be configured to perform various tasks. This includes a number of subcategories:

- Onshore Oil & Gas and Mining (distinct from offshore)
- Cargo Lifting
- Forestry (surveying, logging and protection)
- Firefighting
- Aerial Photography
- Aerial Tours
- Agriculture and Pest Control
- Powerline Repair and Survey
- Media Industry

Offshore Operations include:

- Offshore Oil & Gas
- Offshore Wind Farm
- Marine Pilot Transfer

SIZE CATEGORIES

SINGLE

H120
H125
H130
SA313
SA315
SA316
SA319
SA341
AC311
Bell 204
Bell 205
Bell 206
Bell 407
Bell 505
Bell AH-1
EN480
AH.1
AW119
SW-4
MD 500
MD 520
MD 530
MD 600
R66
Mi-34
S-330
S-333
S-58
FH-1100
JETEXEC 162
K-Max

LIGHT TWIN

AS355
BK117
BO105
H135
H145
Bell 222
Bell 230
Bell 427
Bell 429
AW109
MD 900

MEDIUM

AS365
H155
AC312
Bell 212
Bell 214
Bell 214ST
Bell 412
Bell 430
AW139
AW169
KA-32
Mi-2
S-70A
S-76A
S-76A+
S-76A++
S-76B
S-76C
S-76C+
S-76C++
S-76D
UH-60
Dhruv
Surion

SUPER MEDIUM

H175
AW189
Bell 525

HEAVY

AS332C
AS332L
AS332L1
AS332L2
H215
H225
AC313
Mi-17
Mi-171
Mi-26
Mi-8
S-61
S-64
S-92
BV234

COMPANY NAMES

OEMS

Airbus	Airbus Helicopters SAS
Avicopter	AVIC Helicopter Company
Bell	Bell Helicopter
Leonardo	Leonardo Helicopters
MD	MD Helicopters
Sikorsky	Sikorsky Aircraft
Robinson	Robinson Helicopter
Russian Helicopters	Russian Helicopters, JSC
Enstrom	Enstrom Helicopter
HAL	Hindustan Aeronautics Limited
Kaman	Kaman Aerospace Corporation

OPERATORS

Mainland China	Kingwing	Shanghai Kingwing General Aviation Co.
India	Global Vectra	Global Vectra Helicorp Limited
India	Heligo	Heligo Charters Pvt. Ltd.
India	Pawan Hans	Pawan Hans Helicopters, Ltd.
Indonesia	Travira	Travira Air
Indonesia	Pelita	Pelita Air Service
Japan	Nakanihon Air	Nakanihon Air Service Company, Ltd.
Japan	Hirata Gakuen	HIRATAGAKUEN Aviation Operation Divisions
Mainland China	China Southern	China Southern Airlines General Aviation Limited
Mainland China	COHC	CITIC Offshore Helicopter Co., Ltd.
Mainland China	China GA	China General Aviation Co. Ltd.
Malaysia	MHS	MHS Aviation Berhad
Malaysia	Weststar	Weststar Aviation Services Sendirian Berhad
Thailand	TAS	Thai Aviation Service
Thailand	UOA	United Offshore Aviation Co. , Ltd
Vietnam	VNH	Vietnam Helicopter Corporation

LESSORS

Canada	Eagle	Eagle Copters Ltd.
Ireland	LCI	Lease Corporation International Limited
New Zealand	Airwork	Airwork (NZ) Ltd.
United States	Milestone	Milestone Aviation Group
United States	Textron	Textron Financial Corporation
United States	Macquarie	Macquaire Group

ABOUT ASIAN SKY GROUP

ASIAN SKY GROUP (ASG), headquartered in Hong Kong with offices throughout Asia, has assembled the most experienced aviation team in the Asia Pacific region to provide a wide range of independent services for both fixed and rotary-wing aircraft. ASG also provides access to a significant customer base around the world with the help of its exclusive partners.

ASG provides its clients with the following services:

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The acclaimed Asian Sky Fleet Reports are produced by ASG's market research and consulting team, in collaboration with **Asian Sky Media** — a branch of ASG focusing on media and publications.

Asian Sky Media has a growing portfolio of business aviation reports designed to provide valuable information to readers for a better understanding of the market. Included in the portfolio is the Asia Pacific Fleet Reports for civil helicopters, business jets, business jet charter, as well as comprehensive reports on regional training schools and aviation infrastructure. Asian Sky Media also has a focus report on general aviation in China, with the China GA Report, while Asian Sky Quarterly provides a reader-friendly look at market dynamics within the pre-owned markets of civil helicopters and business jets.

DISCLAIMER

CONTRIBUTION

ASG would like to acknowledge the contributions made by numerous organization, including aircraft operators, OEMs, FBOs, MROs, service providers, authorized service centers and aviation authorities in providing data for this report.

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