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The Development of Turkish Air Traffic, Fleet and MRO Market

*Türkiye Havayolu Endüstrisinde Hava Trafiği, Filosu ve
Mro Piyasasının Gelişimi*

Abstract

The purpose of this paper is to examine the evolution of Turkey's air transportation industry until 2024 by focusing on the growth patterns and the demand structure of passengers/cargo, aircrafts and maintenance repair stations that comprise the industry. Passenger/cargo numbers will continue to increase in the upcoming years in the world. In particular, Eastern Europe including Turkey and Asia will experience the highest growth rates in the next decade and hence the number of aircrafts operating in the industry will mount up as well. Therefore, airline operators will purchase or lease more aircrafts and the required number of skilled workers and maintenance repair stations will rise to ensure safety and airworthiness of aircrafts. The paper analyses Turkey's passenger and cargo traffic growth in the next decade, aircraft orders to meet this growth, the capacity of maintenance repair and overhaul organizations (MROs) to serve additional fleet and potential maintenance market in the nearby countries. Thus, it provides a future outlook of the development of Turkish air transport industry and interactions between its subsectors.

Keywords: Turkish Air Transportation Industry, Aircrafts, Air Passengers and Cargo Demand, Maintenance Repair and Overhaul (MRO) Market.

JEL Codes: L10, L93, L99, R41

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Introduction

The fastest and the most safety mode to travel longer distances between cities, countries or regions for humans and goods is air transportation. Along with global economic development, air traffic has doubled in size since the year 2000 and it is likely to double in the world in the next 15 years. Number of departures will grow from 35 billion to over 60 billion in the near future (IATA, 2014). Overall traffic growth has been reinforced by growth of global real Gross Domestic Product (GDP) and population size in recent years. Emerging markets, led by Asia, Europe and the Middle East, continue to grow faster than the global average of 6-7%. Turkey located between Europe and Asia comes forward with high population growth rate and low cost of travel, dominating more business interactions with other countries and stimulates business/leisure trips to enlarge its commercial base. Its growth rate of over 10% between 2004-2014 exceeds the World's and European average growth rates as well.

All airlines in the country want to increase their networks to meet this demand by purchasing or leasing new aircrafts and training additional workforce to operate-keep them as serviceable. Airlines' new orders and growth plans require more infrastructure such as additional airports, runways, terminals and maintenance hangars as well as more skilled workforce. Turkish government has initiated to build world's largest airport with 150 million passengers per year capacity as a third airport in Istanbul. Also, new airports, runways and terminals have been started or planned to be built in other cities in Turkey to provide adequate infrastructure for increasing demand.

In this study first, we investigate current values and potential future demand of Turkey's passenger and cargo air traffic. We see that Turkey's air traffic growth will continue to grow over the World's average and expect to be over 220 million per year in the next decade. This will require more aircrafts to be delivered and operated in the country. Airline operators especially Turkish Airlines as the largest airline of Turkey with a fastest growth rates in Europe, continue to deliver ordered aircrafts or lease additional ones to meet current increase in demand and place new orders to fulfill forecasted values. Secondly, we examine all current commercial aircraft orders of Turkish airline companies.

According to recent net orders, we forecast nearly 750 aircrafts will be inflight in five years and this value can reach over 1,000 with new orders in the next decade (See Figure 3). New orders will give rise to a fundamental problem for operators when they are delivered. They have to keep all of the operated aircrafts airworthy and safe. Operating an airplane requires maintenance for safety and mandatory checks for airworthiness. It is a fairly regulated industry and requires highly skilled workers. Increase in aeroplane numbers in the country and nearby regions will influence demand for the national maintenance, repair and overhaul (MRO) facilities due to mandatory regulations. MROs must have adequate infrastructure and skilled labor to sustain continuous growth. There are 7 MROs in Turkey and only 2 of them can provide full

maintenance service¹ with a limited capacity. Most of them are in Istanbul. New ones will be built at the third Istanbul airport in the near future. In parallel with traffic and fleet growth, maintenance repair stations in the country must grow at the same rate or faster to satisfy increasing demand of emerging nearby regions like Eastern Europe, Middle East and North Africa. Thirdly, in this study, we analyze Turkish maintenance and repair organizations (MROs) regarding their capacity and employee numbers. Furthermore, we investigate the potential market of Turkish aircraft maintenance industry with respect to regional future aircraft fleet and revenue figures. Finally, we discuss potential constraints of Turkish MROs in the near future.

Different sub-sectors that compose the aviation industry are strongly tied to each other. Increase in air traffic demand requires additional aircrafts to be operated and operating more aircrafts needs more skilled personnel and repair capacity. The purpose of this paper is thus to examine the Turkish aviation industry in three main dimensions: Air traffic, Fleet and Maintenance. This study presents a future picture of the Turkish aviation sub-sectors and their interactions. The rest of the paper is structured as follows: First section provides current and forecasted global air traffic growth patterns, the following section examines existing Turkish aircraft fleet with current net orders and forecasts future potential. The third section analyses national maintenance repair stations by capacity, and employee numbers and presents a future potential revenue forecast and the last section concludes.

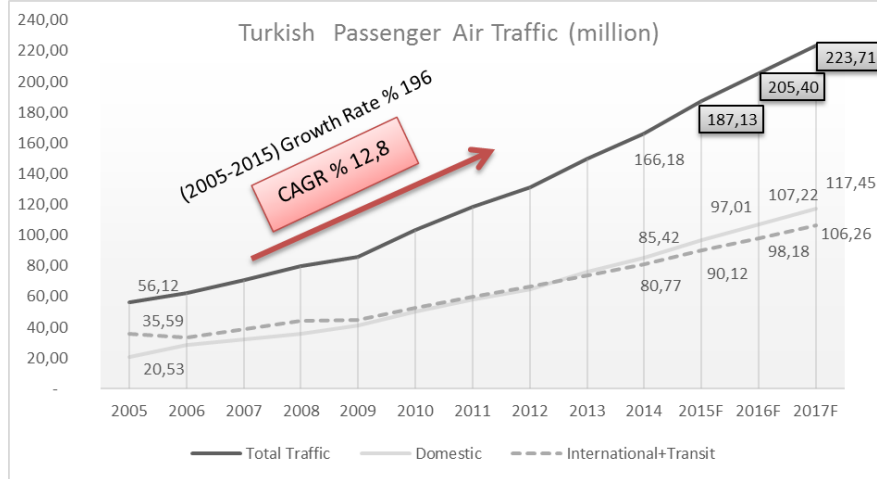
1. Turkish Air Traffic Growth Rates

Turkey, which is the third largest country in Europe and positioned at the crossroads of Europe, Asia and Africa, has been one of the fastest growing markets of the world with a 12.8% CAGR (compound annual growth rate) in passenger traffic between 2005 and 2015. Country's passenger traffic has grown at a rate of 196% from 56 million to over 166 million in the last decade. As an attractive tourism destination Turkey's steady economic growth, young labor population and liberalized market are the main drivers of this impressive growth. In 2014 Turkish air traffic growth rate was 10.9%, which is a lot more than World's average (5,9%) as well as Europe's average (5,7%). (DHMI, 2014)

It is expected that highest growth values of air transportation will last in the near future and according to Turkish Aviation General Directorate of State Airports Authority (DHMI) it is forecasted to double at the end of 2017 with a value of over 220 million passengers as shown in Figure 1.

¹ Full maintenance service MRO: An MRO that can provide all four main dimensions as line, base, component and engine maintenance for a third party airline.

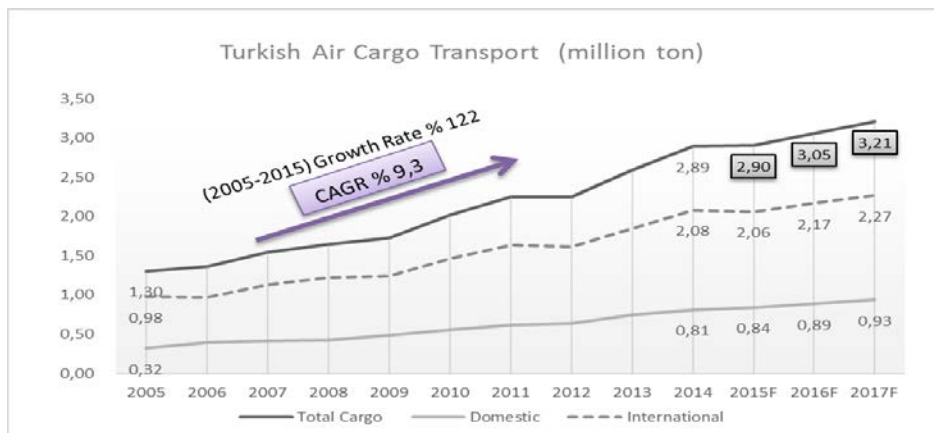
Figure- 1: Passenger Air Traffic Statistics and Forecast (2005-2017)



Source: DHMI, 2014; SHGM, Turkish DGCA, 2015; DHMI, 2015

Freight transport figures have annually risen along with passenger traffic in Turkey with a CAGR of 9,3%. According to Turkish DGCA's annual report 2.89 million tons of goods have been transferred to/from Turkish airports and 72% of those were international cargo. Turkish cargo market has grown 122% during the last decade and will continue its smooth growth in the near future as forecasted in Figure 2.

Figure- 2: Air Cargo Statistics and Forecast (2005-2017)



Source: DHMI, 2014; SHGM, Turkish DGCA, 2015; DHMI 2015

Turkey has remained the main contributor in recent years, adding more than 230 daily flights (excluding overflights) with an additional 11% growth between January-July 2014 period while the whole European region's average growth rate was 1.8% with over 11.2 IFR movements. The closest follower was United Kingdom with additional 94 flights at a rate of 2%. Turkey will observe both the fastest growth rates with a value of 7.2% as average annual growth rate for the upcoming 7 years and the highest number of extra flights with 1,945 additional flights per day in 2020, being the biggest contributor to the growth in Europe. (Eurocontrol, 2014)

As a result of high growth rate expectations for air passengers and cargos as well as flights more aircrafts need to be operated in the country. This enforces airline and cargo operators to order or lease additional aircrafts for the near future.

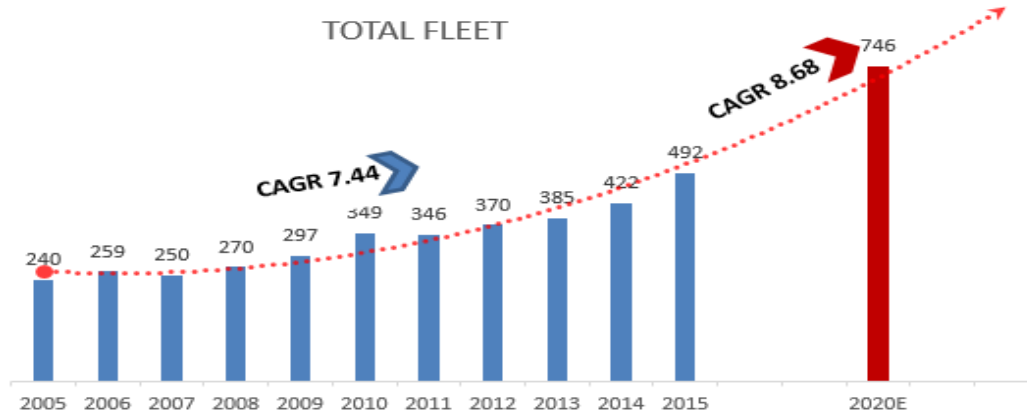
2. Turkish Aircraft Fleet and Orders

Due to mainly Turkish Airlines (THY), the largest airline in the country and one of the fastest growing in the world, Turkey's total fleet has increased dramatically at an average annual growth rate of 7.44% from 240 aircrafts to 492 in the last decade. THY ordered 267 new aircrafts in October 2013 including options, 40 of which are wide-bodies and 227 narrow-bodies. Delivery program of these orders continues. Besides, as the fastest growing airline in Europe in 2011 and 2012, Pegasus Airlines (PGS) ordered 100 additional narrow-bodies (25 optional) in 2012 and has started to receive them. Over 250 of THY orders and all of PGS orders will be delivered at the end of 2020. Hence, we expect at least 746 aircrafts to be operated in Turkey in the next 5 years with a very high value of CAGR² 8.68%. (See Figure 3)

THY dominates passenger aircraft fleet with current 267 aircrafts in service including Anadolujet, a subsidiary of THY. It operates almost all of the wide-body fleet (only 4 of them operated by Onur Air). Regarding the narrow body fleet, it operates 203 airplanes, while PGS and Sun Express operate over 50 each. Other airlines have less than 20 aircrafts including Onur Air and Atlasglobal as network carriers, plus Corendon, Freebird and Tailwind airlines as charter carriers. (See Table 1). Furthermore, the fleet of three independent cargo airlines plus cargo aircrafts of THY compose the cargo fleet. ACT, THY and MNG are the major cargo carriers with 10 aircrafts for each with a capacity of 787.5, 563.8 and 431 tons in order. ULS cargo is the remaining cargo carrier with 3 aircrafts and 120 tons of fleet capacity. (See Table 2)

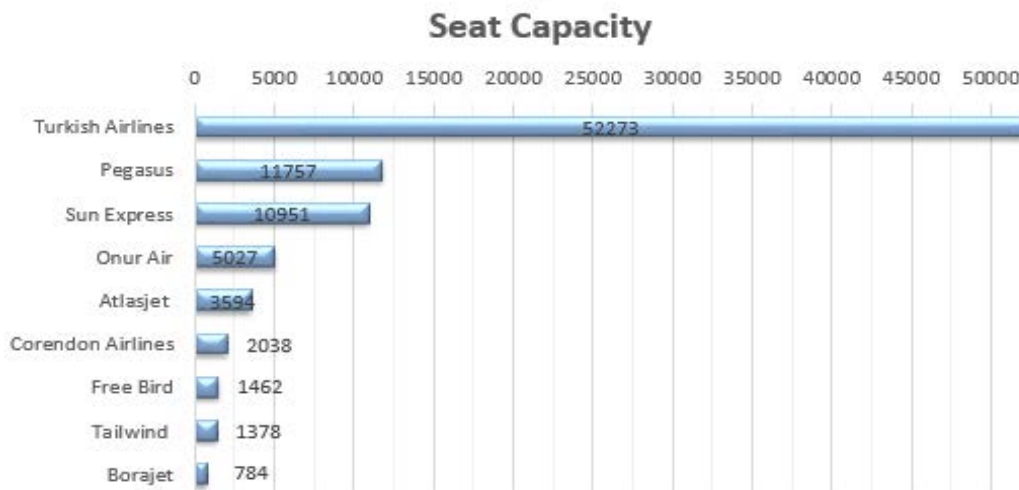
² CAGR: Compound Annual Growth Rate

Figure- 3: Turkey’s Current Aircraft Fleet and Orders (01Jun15)



Source: CAPA, 2013; Pegasus, 2015; Airbus, 2012; ASCEND, 2014 and Turkish Airlines 2015

Figure- 4: Available Seat Capacity of Airlines in Turkey (June 2015)



Source: Atlasglobal; Borajet; Corendon Airlines; Freebird Airlines; Iz Air; Onur Air; Pegasus Airlines; Sun Express Airlines and THY official web sites.

Figure 4 shows available seat capacity of each airline operating in the country. We calculate these capacities using active fleet and cabin configuration seat numbers as of 01 June 2015. Turkish Airlines, which carried 54.7 million passengers in 2014 with a number of 52,273 total fleet available seat capacity, largely dominates Turkish passenger air traffic. As the country's fastest growing low cost carrier (LCC), Pegasus also operates IzAir's 7 B737s. Adding these capacity to its fleet, Pegasus reaches 11757 total fleet available seat capacity and ranks second in the industry. Sun Express whose equal shareholders are Turkish Airlines and Lufthansa has the third highest capacity with 10951 available fleet seats. Remaining air carriers have lower than 10,000 total fleet available seats.

Table- 1: Passenger Airlines Fleet in Turkey (June 2015)

Passenger Airline	Narrow-Body				Wide-Body			Total Fleet
	B737	A320	EMB190	Total NB	B777	A330/340	Total WB	
Turkish Airlines*	109	91	3	203	20	44	64	267
Sun Express	59	-	-	59	-	-	-	59
Pegasus**	46	5	-	51	-	-	-	51
Onur Air	-	18	-	18	-	4	4	22
Atlasglobal	-	18	-	18	-	-	-	18
Corendon Airlines	11	-	-	11	-	-	-	11
Free Bird	8	-	-	8	-	-	-	8
Tailwind	7	1	-	8	-	-	-	8
Iz Air	7	-	-	7	-	-	-	7
Borajet	-	-	8	8	-	-	-	8
TOTAL	247	128	11	391	20	48	68	459

Source: Atlasglobal; Borajet; Corendon Airlines; Freebird Airlines; Iz Air; Onur Air; Pegasus Airlines; Sun Express Airlines and THY official web sites.

Table- 2: Cargo Airlines Fleet in Turkey (June 2015)

Cargo Airline	B737F	B747F	A300-B4F	A300-200F	A300-600F	A310F	A330F	Total Fleet
My Cargo	-	5	5	-	-	-	-	10
MNG Cargo	2	-	-	1	6	-	1	10
Turkish Cargo	-	-	-	-	-	3	7	10
ULS Cargo	-	-	-	-	-	3	-	3
TOTAL	2	5	5	1	6	6	8	33

Source: My Cargo; MNG Cargo; Turkish Airlines and ULS Cargo official web sites

* Includes Anadolujet fleet aircrafts which are owned by THY.

** One B737 is excluded since it is not operated in Turkey.

In addition to Turkish Airlines, three other cargo airlines operate freighters in Turkey. My Cargo, which is established as a partnership between ACT (a former Turkish cargo airline) and HNA Group (one of the largest airline group in China), has the highest air cargo capacity of 787.5 tones, followed by Turkish Cargo (563.8 tones), MNG Cargo (431 tones) and ULS Cargo (120 tones). Turkish Cargo also carries cargo in the lower deck of passenger aircrafts over the World, called as belly cargo. If we add belly cargo values, total cargo capacity of Turkish Cargo will be more than declared because it carries a lot of international cargo especially with its wide body aircrafts. (Figure 5)

Turkish national passenger aircraft fleet consists of total 492 aircrafts with a distribution of 80% narrow-bodies³ and 20% wide-bodies⁴. Narrow-body fleet, which consists of 393 aircrafts including cargo aircrafts, dominated by B737s (63%) twice of A320s. Wide-body fleet has 99 aircrafts with a distribution of nearly 57% of A330/A340s, 20% of B777s and remaining 23% consists of A300 freighter sub models, A310 freighters and B747 freighters.

Figure- 5: Available Cargo Capacity of Freighter Aircrafts in Turkey (June 2015)



Source: My Cargo; MNG Cargo; Turkish Cargo and ULS Cargo official web sites

Every aircraft that is purchased, leased or owned by an operator needs some maintenance to stay airworthy and serviceable as long as it flies to transport passengers/cargos from one airport to another. Due to mandatory regulations, airworthiness requirements and common constraints, we think that maintenance organizations will be a significant determinant in the global competition especially for the large network carriers like Turkish Airlines.

³ Narrow Body or Single Aisle Aircraft: An aircraft with 3 to 4 meters (10 to13 ft.) fuselage width and 2 to 6 abreast along a single aisle

⁴ Wide Body or Twin Aisle Aircraft: A larger aircraft with a fuselage diameter of 5 to 7 meters (16 to 20 ft.), twin aisles and usually configured with multiple travel classes

3. Turkish MRO Market Outlook

Aircraft maintenance involves preservation, inspection, overhaul, and repair of aircraft and also replacement of parts. Technical activities related to the Turkish registered aircrafts, personnel and organizations are highly regulated by the US, EU and Turkish authorities. Maintenance, repair, and overhaul (MRO) as a group is the most commonly used term to describe aircraft maintenance activity. An MRO organization is a large company that holds numerous repair station privileges from different aviation authorities around the world, and it accomplishes major repairs on the transport category airplanes that primarily belong to airlines and leasing companies. It consists of four main maintenance segments: (1) Airframe, (2) Engine, (3) Component and (4) Line. (ARSA, 2014).

The purpose of maintenance on an airplane is to certify its airworthiness throughout its operational life. All airlines in Turkey are responsible for conducting required checks (either by themselves or through a qualified provider, MRO) in compliance with the aviation safety regulations of Turkish Directorate General of Civil Aviation (DGCA). Besides, depending on the aircraft and the operator's network structure all maintenance activities may have to be performed in compliance also with the aviation safety regulations of Federal Aviation Administration (FAA), the European Aviation Safety Administration (EASA) and/or national DGCA of the other countries.

3.1. Turkish MROs and Capacities

All of the repair organizations in Turkey which are authorized by Turkish DGCA for A1 rating (Aeroplanes above 5700 Kg) and/or C1 to C20 rating (component repairs) for passenger aircraft components are listed in Table 3. Turkish Technic and My Technic are the only MROs providing full aircraft maintenance services in Turkey. Turkish Technic as a subsidiary of Turkish Airlines provides both in house maintenance and third party maintenance in own facilities located at IST, SAW and ESB airports. My Technic, which is a joint venture of Turkish ACT Cargo Airlines and Chinese HNA Group, also performs both My Cargo Airlines' in house and third party maintenance. Onur Air Technic and ATS Team provide airframe (base), line and component maintenance excluding engine overhaul in addition to their in house maintenance for Onur Air and Atlasjet Airlines, respectively in Istanbul. Moreover, Asal Aviation as an independent MRO in Isparta provides line, base and component repairs including fuselage paint service to customer airlines. MNG Jet Aviation and Amac Aerospace can perform line and base checks of some business jets in their facilities in Istanbul. Ayjet in Istanbul and Sun Express Technic in Antalya can perform component repairs with line checks. A joint venture between Turkish Technic and Goodrich provides only component services for nacelles and thrust reversers in Kocaeli province, Prima Aviation provides some component repairs in Istanbul and Antalya and Total Aviation provides some in Istanbul. There are only two engine maintenance providers in Turkey, Turkish Engine Center (TEC) and Turkbine. TEC, a joint venture between Turkish Technic and Pratt&Whitney,

has annual capacity to provide up to 300 engine overhaul of various subtypes of CFMI and IAE engines. Also, Turkbine, which is a joint venture between Turkish Technic and Zorlu Group, provides GE CF6-80C2 type aircraft engine services. All other organizations can provide only line checks in house or third party and do not have facilities to do airframe maintenance.

Table- 3: A1 and C Category Authorized Maintenance Organizations in Turkey (June 2015)

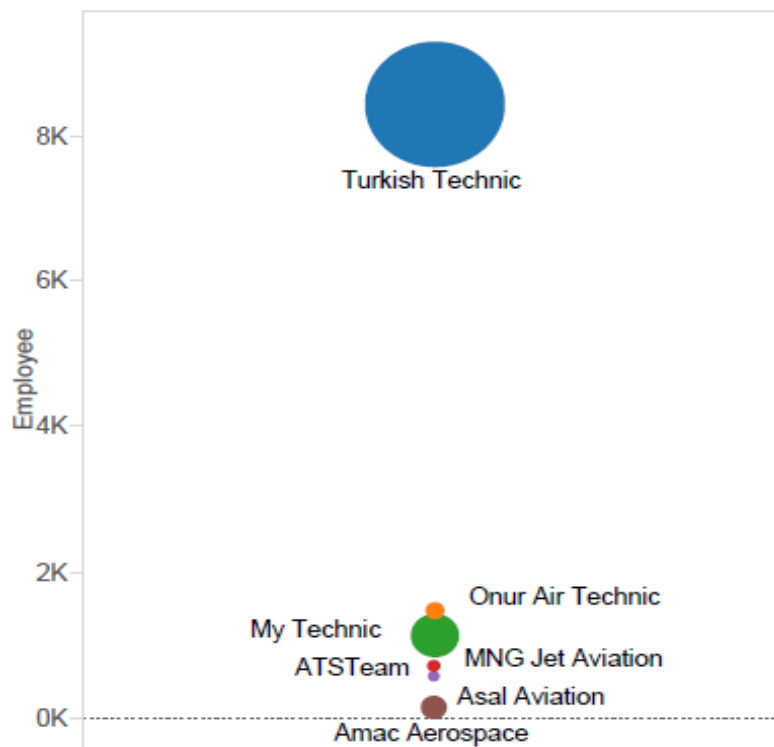
MRO	Line	Base	Comp.	Engine	Loc. Airport	Loc. City
Turkish Technic (TT)	X	X	X	X	IST SAW	Istanbul
My Technic	X	X	X	X	ESB	Ankara
Onur Air Technic	X	X	X		SAW	Istanbul
ATSTeam	X	X	X		IST	Istanbul
Asal Aviation	X	X	X		ISU	Isparta
MNG Jet Aviation	X	X			IST	Istanbul
Amac Aerospace	X	X			IST	Istanbul
AYJet	X		X		IST	Istanbul
Sunexpress Technic	X		X		AYT	Antalya
Pegasus Technic	X				SAW	Istanbul
MNG Technic	X				IST	Istanbul
Freebird Tecnic	X				AYT	Antalya
ULS Cargo Technic	X				IST	Istanbul
Corendon Technic	X				AYT	Antalya
Tailwind Technic	X				AYT	Antalya
MATS Technic	X				AYT	Antalya
Borajet Technic	X				IST	Istanbul
ACT Technic	X				SAW	Istanbul
Ak Aviation	X				IST	Istanbul
Korfez Aviation	X				IST	Istanbul
TDT Aviation	X				AYT	Antalya
Arkas Air	X				ADB	Izmir
Sportif Air	X				ESB	Ankara
MGA Aviation	X				AYT	Antalya
Nurol Aviation	X				ESB	Ankara
					IST	Istanbul
Prima Aviation			X			
					AYT	Antalya
Goodrich/TT			X		***	Kocaeli
Total Aviation			X		IST	Istanbul
Turkbine				X	IST	Istanbul
Pratt&Whitney/TT				X	SAW	Istanbul

Source: SHGM, Turkish DGCA, 2015

3.2. Employee Numbers

Figure 6 shows employee numbers of airframe MROs in Turkey. Circle sizes indicate closed area of maintenance facility buildings in (m²) including hangars. Turkish Technic is the largest MRO in terms of both employee numbers and facility area. It has increased number of workers to almost 7000 and total closed facility area to 549,000 m² after merging with its subsidiary MRO called HABOM in 2015. My Technic has the second largest MRO space of 60,000 m² with 416 workers and Onur Air has 8,000 m² with 350 workers.

Figure- 6: Employee Numbers & Facility Capacities of Airframe MROs in Turkey

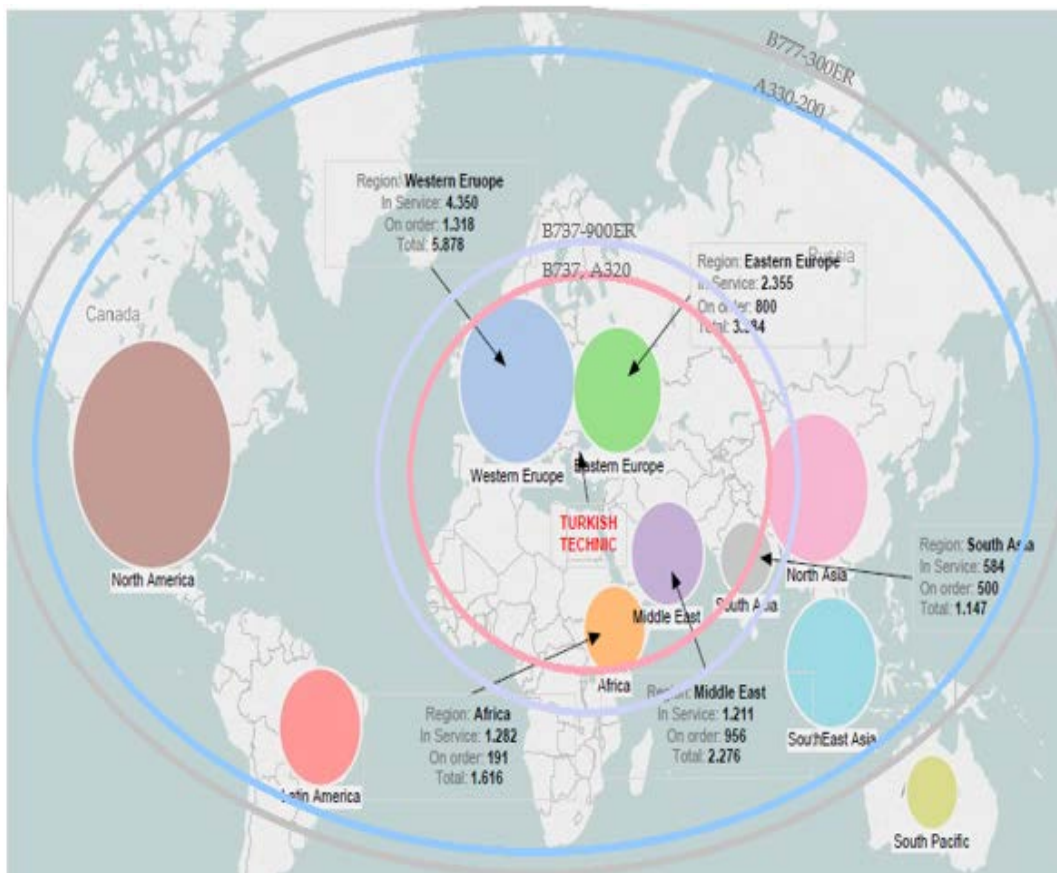


Source: Turkish Technic; My Technic; Onur Air; ATS Team; Asal Aeronautics; MNG Jet; Kokpit Aero, 2015

3.3. Turkish MROs Potential Market Forecast (2014-2024)

Turkish MROs being mainly in Istanbul, Turkey, have an incredible geographic location in the world. Figure 7 shows Turkish MROs potential market with regional fleet distributions of the world. The circles in the figure which are centered around Istanbul presents fully loaded maximum range of most commonly utilized aircraft types globally. These are Boeing B737-900ER, B737-800, Airbus A320 for narrow body fleet and Boeing B777-300ER, Airbus A330-200 for wide body fleet.

Figure- 7: Potential Market for Turkish MROs (2024)



Fully Loaded Maximum Ranges From Istanbul

B777-300ER	14,600 km
A330-200	13,450 km
B737-900ER	5,925 km
A320 or B737-800	5,700 km

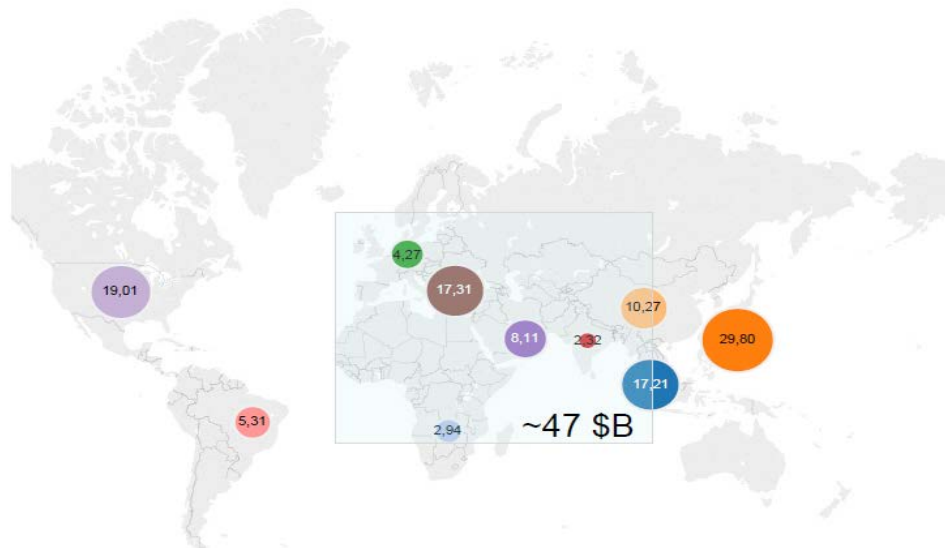
Source: CAPA, 2014; ASCEND, 2014; Airbus; Boeing; Bombardier; Embraer; IATA, 2014

All narrow body commercial aircraft operators established in almost all Africa, half of South Asia, Middle East and whole Europe are potential customers of Turkish MROs with a nonstop flight. There exist approximately 13,700 potential aircrafts (9,500 aircrafts in service and over 4,000 new orders) inside the B737-900ER range circle of the figure. This value is equal to 36% of global fleet including orders. If the outermost circle of B777-300ER is considered, all of the world fleet (except some parts of South Pacific region) can reach Turkish MROs with a nonstop fully loaded flight utilizing a commonly used wide-body aircraft.

Figure 8 shows Turkish MROs' potential market of nearby regions and global MRO revenue forecast distribution of regions. We estimate potential revenue for a full service MRO in Turkey as 47 billion US dollars in 2024 based on forecasted fleet profile described in Figure 7. This market includes all of Europe, Middle East and India, most of North Africa and some of West Asia and South Asia. Last year's global commercial aircraft MRO market revenue was almost \$58 billion and it will rise over \$70 billion in 2019 and nearly \$90 billion in 2024 (TeamSai, 2014). We can say that Turkish MROs have great opportunity to get some market share from a \$47 billion aircraft maintenance market from its closest regions which accounts for half of the total world maintenance market revenue in 2024.

Although Turkish MROs have a lot of advantages such as geographical situation and low labor costs, there are some fundamental constraints to meet potential demand. We can say that main constraints are infrastructure, absence of skilled workers and supply chain problems.

Figure- 8: Turkish MROs Potential Market in 2024



Source: ARSA, 2014

3.4. Turkish MROs Potential Constraints

First main constraint is insufficient infrastructure like hangars. Turkish Technic (TT), the largest MRO in Turkey, has four hangars in IST⁵ airport, 2 hangars in SAW⁶ and one hangar in ESB. They are sufficient for THY's rapidly growing fleet but will be incapable for third party demand in the future. TT plans to build additional hangars in the new airport to be built in Istanbul. Second largest MRO My Technic has only one hangar in SAW airport and third largest Onur Air Technic has only one hangar in IST airport as well. IST is a highly congested airport and there is no additional space to build a new hangar. If an MRO wants to get revenue from third party airframe maintenance, it has to build additional hangars in SAW or the new airport until 2024.

Supply chain problem is the second main constraint for a Turkish MRO due to the fact that almost all aircraft material and components are imported from European or US manufacturers. They have to stock adequate number of aircraft parts to prevent AOG⁷ condition. Keeping a stock of expensive aircraft parts always costs more than purchasing or leasing it just before aircraft is grounded. Timing of parts availability is a very difficult issue for aviation. If there is no serviceable part to install after removing an unserviceable one, aircraft falls into an AOG condition. An AOG part is always more expensive than a regular purchase of the same part. It takes time to transport parts from other countries and customer airline of MRO loses money for each minute aircraft stays on ground. In other words, an efficient supply chain highly depends on the level of investment. In the long term, supply chain problems can be resolved by investing more in spare parts, signing with more than one advanced suppliers or pool agreements with both OEMs and forwarders using an effective forecast of spare parts.

The third and the worst constraint is the unavailability of aircraft maintenance professionals (AMPs). AMPs are highly skilled workers who perform scheduled or unscheduled maintenance, repair, overhaul or inspections on an aircraft or components of an aircraft, also all engineering activities to maintain aircraft and components serviceable and airworthy according to regulations of FAA, EASA or national DGCA's. Theoretical and practical training and authorization process of an AMP takes minimum 7 to 10 years after high school or university graduation in Turkey. (EASA Part 66); (SHY-66) Unfortunately, the problem of the lack of skilled AMPs will get worse in the future and become such a challenging issue in the global aviation industry (except USA). In particular, growing regions of the world like Turkey will have serious problems to fill their skilled aircraft maintenance staff vacancies in the near future. This situation might result in under capacity conditions and empty maintenance slots in the hangars of an

⁵ IST (Atatürk Airport) is the first international airport of Istanbul located on the European side of the city.

⁶ SAW (Sabiha Gökçen Airport) is the second international airport of Istanbul located on the Asian side of the city.

⁷ AOG: Aircraft on Ground is a term in aviation maintenance indicating that a problem is serious enough to prevent an aircraft from flying. Usually no available spare part results with an AOG condition.

MRO. Also, shortage of AMPs will have a negative effect on aviation safety in the country. (TOBB, 2014); (Boeing, 2014); (ICAO, 2010)

Finally, Turkish MROs except TT have infrastructure and investment constraints today. On the other hand, TT has sufficient facilities, good financial statement and adequate future investment plans to do third party maintenance. All MROs are likely to face with the shortage of skilled AMPs while there is a tremendous market potential in the nearby regions. Depending on global monopolies and dominant MROs, we expect that labor force availability issue will be the most important constraint for all Turkish MROs in capturing third party revenue.

Conclusion

This paper investigates current situation and provides a realistic forecast of the development of the air transport industry in Turkey on three essential dimensions; air traffic, fleet and maintenance. Turkish Air Transportation sector is growing at higher rates than the global average. Turkey has started to utilize its great advantages in the air transport sector. Some of these advantages are geographic location, economic stability, low labor cost, large size of young population, high potential of domestic passengers, excessive touristic prospects, high number of Turkish workers in other countries and international airports with only one leg flight distance from the rest of the world. Thus, boosted by the governmental support international and domestic air transport in Turkey will continue to grow up at higher than global rates at least for the next decade. If Turkey can sustain this development, it is going to be center of the world air traffic in the future.

As a result of the rapid development air traffic figures will increase at unprecedented rates. More passengers require more aircrafts and Turkish operators led by Turkish Airlines order additional aircrafts or lease new ones. Private sector and the government have started to construct new airports and runways including the world's largest airport in the country. Each additional aircraft that starts to fly in the country indicates additional maintenance capacity requirement for Turkish MROs for safe flights. Also, there exists \$47 billion aircraft maintenance market potential in the region. Turkish MRO sector seems to be out of step with the high growth rates of air traffic and fleet. MROs other than Turkish Technic need further infrastructure to serve national fleet and a shortage of skilled Aviation Maintenance Professionals will be a severe problem of the industry particularly in the near future. All of Turkish MROs require considerable investments for their infrastructure and skilled labor constraints to meet both the national and international demand.

Finally, this study exposes the strong interactions of the three essential sectors of Turkish air transportation as passenger/cargo, aircraft and MRO and provides a cumulative current and future outlook of the industry to the aviation community.

References

- Airbus (2015). Orders & Deliveries. <http://www.airbus.com/company/market/orders-deliveries/> 04.05.2015
- Airbus (2012). Press releases. <http://www.airbus.com/presscentre/pressreleases/press-release-detail/detail/pegasus-selects-up-to-100-a320neo-family-aircraft/> 05.01.2015.
- ARSA (2014) Aeronautical Repair Station Association Report, Global MRO Market, Economic Assessment, Air Transport. Teamsai Consulting Services. 404.762.7257
- Asal Aeronautics. (2015). <http://www.asaltechnic.com/> 15.06.2015
- ASCEND. (October 2014). Changing Fleets & Impact on MRO Demand. Rob Morris. Airline E&M: Central, Eastern & Southern Europe. Flight Global Consultancy
- Atlasglobal. (2015). <http://www.atlasglb.com/filo/> 15.06.2015
- ATS Team. (2015) Aviation Technical Services. <http://www.atsteam.aero/> 15.06.2015
- Boeing.(2015). Orders&Deliveries.NetOrders [http://www.boeing.com/commercial/#/orders-deliveries./](http://www.boeing.com/commercial/#/orders-deliveries/) 14.06.2015
- Boeing (2013). Current Market Outlook 2013-2032. Accessed:16.06.2015, <http://www.boeing.com/commercial/market/>
- Boeing (2014). Pilot and Technician Outlook. Accessed:16.06.2015, <http://www.boeing.com/commercial/market/long-term-market/pilot-and-technician-outlook/>
- Bombardier (2015). Profile, strategy and market . <http://ir.bombardier.com/images/ckeditor/staging/upload/ckeditor/files/BInc-Profile-Strategy-and-Market-FEB-2015-en3.pdf> /11.06.2015
- Borajet (2015). Filo. <http://borajet.com.tr/filo.html> /15.06.2015
- CAPA, Centre For Aviation (2013). Aviation Analysis, Turkish Airlines reiterates growth opportunities and a more profitable outlook for SunExpress. [http://centreforaviation.com/analysis/turkish-airlines-reiterates-growth-opportunities-and-a-more-profitable-outlook-for-sunexpress-140667 /](http://centreforaviation.com/analysis/turkish-airlines-reiterates-growth-opportunities-and-a-more-profitable-outlook-for-sunexpress-140667/) 01.08.2015
- CAPA, Centre For Aviation (2014), World Aviation Yearbook 2014.
- Corendon Airlines (2015). Filo <http://www.corendonairlines.com/filos.aspx/>15.06.2015

- DHMI (2014). Turkish Directorate General of Civil Aviation (DGCA), Annual Report 2014. <http://web.shgm.gov.tr/tr/kurumsal/4006-faaliyet-raporlarimiz/01.06.2015>
- DHMI (2015). Türkiye Geneli Havalimanları Uçak, Yolcu ve Yük Trafiği İstatistikleri (2002-2014). Ankara: Sivil Havacılık Genel Müdürlüğü <http://www.dhmi.gov.tr/getBinaryFile.aspx?Type14&dosyaID=1049> /11.03.2015
- Dursun, Mehmet Erkan, John F. O'Connell, Zheng Lei, and David Warnock-Smith. "The transformation of a legacy carrier - A case study of Turkish Airlines." *Journal of Air Transport Management* (Elsevier), 2014:40: 106-118.
- EASA, European Aviation Safety Agency Part 66. (n.d.). A.30. Experience Requirements. <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:315:0001:0165:EN:PDF> /11.05.2015
- Embraer (2014). Press and Events. <http://www.embraerexecutivejets.com/en-US/press-events/press-releases/Pages/Embraer-Reaches-Record-Backlog-and-Delivers-19-Commercial-and-15-Executive-Jets-in-3Q14.aspx>. /06.05.2015
- Eurocontrol (2014). Eurocontrol 7 year IFR Flight Movements and Service Units (Forecast 2014-2020). The Statistics and Forecasts Service (STATFOR)/ European Organisation for the Safety of Air Navigation (EUROCONTROL) / the European Commission
- Freebird Airlines (2015). Filomuz. <http://www.freebirdairlines.com/tr/filomuz.asp> /15.05.2015.
- IATA, International Air Transport Association (2014). "The shape of air travel markets over the next 20 years". Pearce Brian <http://www.iata.org/publications/Pages/20-passenger-forecast.aspx>. /17.05.2015
- ICAO, International Civil Aviation Organization (2014). Annual Report of the Council-2013. <http://www.icao.int/annual-report-2013/Pages/financial-results-financial-highlights-2013.aspx> /11.05.2015
- ICAO, International Civil Aviation Organization (2011). Global and Regional 20 Year Forecasts, Pilots, Maintenance Personnel, Air Traffic Controllers. Doc 9956
- Iz Air (2015). Hakkımızda. <http://izair.com.tr/tr/hakkimizda/filomuz> /15.06.2015
- Kokpit Aero (16 Feb 2015). Haberler. 15.06.2015: <http://kokpit.aero/atsteam-personel-cikartiyor>
- MNG Cargo (2015). Kurumsal. <http://www.mngairlines.com/TR/Kurumsal.aspx> /15.06.2015

- MNG Jet (2015).MNG Jet Aerospace Inc. <http://www.mngjet.com/boeing-approval.html>
/15.06.2015
- My Cargo (2015).Kargo Filomuz <http://www.mycargo.aero/tr/cargofleet.php>
/15.06.2015
- My Technic (2015). MRO Services <http://www.mytechnic.aero/indextr.php#undefined>
/15.06.2015
- Onur Air (2015). Uçuş Filosu <http://www.onurair.com/tr/seyahat-bilgileri/detay/Ucus-Filosu/33/30/0> /15.06.2015
- Onur Air (2015). Flight Safety, Technical Infrastructure. <http://www.onurair.com/en/corporate/detail/Flight-Safety/111/179/0> /15.06.2015
- Pegasus Airlines (2015). Filomuz <http://www.flypgs.com/pegasus-hakkinda/filomuz.aspx> /15.06.2015
- Pegasus Airlines (2015). Operasyonel ve Finansal Veriler. <http://www.pegasusyatirimciliskileri.com/operasyonel-ve-finansal-veriler/filo-bilgisi.aspx>
/15.06.2015
- SHGM, Sivil Havacılık Genel Müdürlüğü, Turkish DGCA (2015). Authorized Maintenance Organizations. <http://web.shgm.gov.tr/en/havacilik-isletmeleri/2064-authorized-maintenance-organizations> /18.06.2015
- SHY-66 (2013). Sivil Havacılık Genel Müdürlüğü, Hava Aracı Bakım Personeli Lisans Yönetmeliği. <http://web.shgm.gov.tr/tr/mevzuat/2155-mevzuat> /07.06.2015
- Sun Express Airlines (2015). Filo vb. <http://www.sunexpress.com/tr/irket/filo-vb>
/15.06.2015
- TeamSai (2014). 2014-2024 Global MRO Forecast. MRO Asia Conference Report.
- TOBB (2014). Türkiye Sivil Havacılık Meclisi Sektör Raporu 2013. Ankara: Türkiye Odalar ve Borsalar Birliği. 2014/229
- Turkish Airlines (2015). Seyahat Bilgileri, Filo. <http://www.turkishairlines.com/tr-tr/seyahat-bilgileri/turk-hava-yollari-yolcu-kargo-airbus-boeing-tum-ucak-filo>
/15.06.2015
- Turkish Airlines (2015). Press Releases, Fleet. <http://www.turkishairlines.com/en-int/travel-information/turkish-airlines-passenger-cargo-airbus-boeing-all-flight-fleet> /11.02.2015

Turkish Technic (2015). Annual Reports. 2014. <http://www.thytekNIK.com.tr/faaliyet-raporlari.html> /15.06.2015

Turkish Technic (2015), Financial Statements

<http://www.thytekNIK.com/financial-statements.html>. /16.05.2015

ULS Cargo (2015). Filomuz http://www.uls-global.aero/tr/default.asp?sayfa=_filomuz /15.06.2015).

TÜRKİYE HAVAYOLU ENDÜSTRİSİNDE HAVA TRAFİĞİ, FİLOSU VE MRO PIYASASININ GELİŞİMİ

Özgür YUMAKOĞULLARI *

Resul AYDEMİR **

Bülent GÜLOĞLU ***

Özet

Bu çalışmanın amacı, Türkiye'deki havayolu taşımacılığının 2024 yılına kadar muhtemel gelişimini yolcu-kargo artışı, uçak sayısı ve bakım merkezleri temelinde ortaya koymaktır. Tüm dünyada, özellikle hızlı bir gelişim içinde bulunan Türkiye'nin de içinde bulunduğu Doğu Avrupa ve Asya'da, taşınan yolcu ve kargo sayısı gün geçtikçe artmakta, buna bağlı olarak daha fazla uçağa ihtiyacı olan operatörler yenilerini sipariş etmekte veya kiralamaktadırlar. Bu uçakların güvenli bir şekilde uçmaları için gerekli olan işgücü ve bakım merkezi ihtiyacı da aynı oranda artmaktadır. Bu çalışma 2014-2024 döneminde Türkiye'de havayolu yolcu ve kargo trafiğinin ne kadar büyüyeceğini, bu büyümeyi karşılamak için sipariş edilen uçak sayı ve modellerini, bu uçaklara hizmet verebilecek bakım onarım merkezlerinin kapasitesini ve bu merkezlerin çevre ülkelerle birlikte piyasa potansiyelini analiz etmektedir. Böylelikle Türkiye'deki hava yolu taşımacılığı sektörünün muhtemel gelişimi ve alt sektörleriyle etkileşimleri konusunda kapsamlı bir bakış açısı ortaya konulmuştur.

Anahtar Kelimeler: Türkiye Hava Taşımacılığı Endüstrisi, Uçak Modelleri, Hava Yolu, Yolcu Kargo Talebi, Bakım Onarım Merkezi, MRO Piyasası.

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