

Aircraft and Helicopter Usages in Forest Fires in Turkey (A Case Study: Antalya Region)

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Abstract- Turkey has 20.7 millions ha forest area and 8.9 million ha of this area is productive forest. Antalya is the most important region on forest fires in Turkey because of the geographical situation and climatic conditions. Fighting against forest fires is getting more important day by day. Aerial fire fighting is the use of aircraft and other aerial resources to combat forest fires. In this study, aircraft and helicopter usages in forest fires in Turkey are investigated. In this research, it has been tried to determine which aircrafts and helicopters used for suppression in the forest fires in Turkey and some solutions were suggested. Fire suppression applications on the forest fires in Antalya Regional Forest Directorate were examined and the results have been evaluated. This study is the part of master thesis which has been carried out Forestry Faculty of İstanbul University.

Keywords: Forest fire, forestry, aircraft, helicopter, Antalya.

1. INTRODUCTION

Turkey is a country with a land mass of 77,079 million hectares (ha), of which 20,749 million ha are forested, representing about 26 per cent of country's total land area. About 12 million ha of forested land is subjected to and under the threat of forest fires (Bilgili et al., 2005). Fire management is carried out by the state forest enterprises functioning under regional directorates in Turkey.

Because of the geographical and climatic similarity, forest fires are the most important subject in the summer period of forestry sector in all Mediterranean countries. Turkey is acceptable successful in fighting forest fires in the region with respect to other Mediterranean countries (Spain, Greece, Italy and France) in comparison (OGM, 2008). Ratio of the damaged areas to country's forest area due to forest fires 0,16 % in Turkey between 2003-2007 years (Figure 1).

However, Turkey's mountainous, rugged terrain, often makes it difficult fighting forest fires off ground intervention. In such cases, aircraft and helicopters are more important against forest fires fighting. Sometimes it is difficult to use aircraft or helicopters because of the air conditions, but aerial intervention is very important especially in the first interventions effect.



Figure1. Ratio of the damaged areas due to forest fires to country's forest area in Mediterranean countries (2003-2007).

1.1 Antalya Region

Antalya is situated on the Mediterranean coast of Turkey, in South Anatolia (Figure 2). Between the longitudes 29°20'-32°35'East and latitudes 36°07'-37°29'North. The province covers an area of %26 (20.591 sq m) of Turkey. Over three quarters of the region is covered by mountainous terrain called the Taurus Mountains. Some ten of these mountains are over 2500 metres high with two exceeding 3000 metres and 290 km of the 590 km coast is natural beach (Anonymus, 2010). Because of the geographical situation and climate conditions, Antalya is one of the most important region on forest fires in Turkey. Also, Antalya is dominated by a typical Mediterranean climate, summers are hot and dry, winters warm and rainy. During the summer period and in the september high temperatures are more than 40 °C.

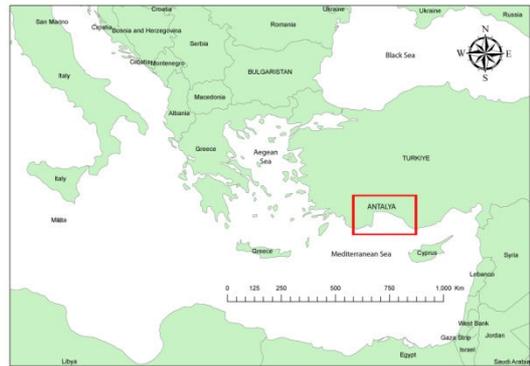


Figure 2. Location of Antalya province.

Turkish Red Pine (*Pinus brutia* Ten.) is the most sensitive and the most covering tree species (46,83 %) in the forested area in Antalya Region (Ay, 2010). Relative humidity, wind speed and direction, dominant tree species which is red-pine, so it can easily be seen of sensity on forest fires of Antalya. Generally, in the west and south parts of the country fire sensitivity is the highest degree as we see in Figure 3. In this manner fire organization and aerial forest fire fighting is focused on these regions.



Figure 3. Map of the forest fires of Turkey (OGM, 2008).

Antalya Region is one of the three critical region for forest fires in Turkey. Between 2000-2010, for the 10 years period, the average annual fire frequency is 203, the annual average amount of area burned is 712,2 hectares. Fire in the per capita area, 3,5 hectares, is burning the area ratio of the total forest area of 0.00090 % is.

There was an extreme fire in Taşagül-Serik Forestry Management Directorate in 2008 which is the biggest fire in history of the Republic of Turkey . Burned area was 15. 856 ha for numeric data, caused by the abnormal rise in the year 2008 were also evaluated. The frequency of fire in 2008 is 212, the burning area is 17.010 hectares, fire in the per capita area 80.23 hectares (OGM, 2010). According to the day's hours, fire number for 2008 evaluated in the following chart (Figure 4). Fire risk is the most critical from 10:00 to 16:00 in the day as shown in the chart. Therefore, during the fire season between these hours should be more careful.

Also, statistics show that, 144 forest fire occurred and totaly 490,52 hectares area burned in Antalya Directorate of Forestry in 2009. When analysed with respect to fire causes for the last 10 years, it is seen that 44 per cent negligence and carelessness in Antalya region.

There are 52 observation towers, 33 communication centers, 1255 forest fire workers (first intervention teams, fire-machine teams, the helicopter crews), 3 helicopters, 2 fire-fighting aircrafts, 97 fire-machines, 17 water fire-machine, 15 first intervention vehicle, 13 bulldozers, 11 trailers, 10 grader in the forest fire organization in Antalya Directorate of Forestry. Approximately 2.840.000 USD has been spent in fire suppression facilities in Antalya Region in 2009.

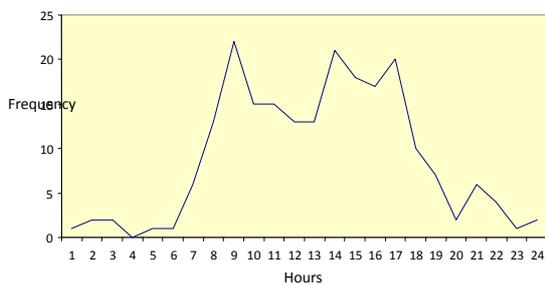


Figure 4. Relationship between the fire frequency and hours of the day in 2008.

2. METHOD

In the frame of this research, aircraft and helicopter usages and their success in forest fires in Turkey have been observed . It has been tried to determine which aircrafts and helicopters used for suppression in the forest fires in Turkey and some solutions were suggested. So, the main objectives of the study were as follows.

1. To define the aircraft and helicopter usages in forest fires in Turkey in the case of Antalya Region.
2. To define the types of the aircraft and helicopter using at forest fires in Turkey and compare with the world.
3. To assess the aerial fire fighting by observing of the surveys.
4. To evaluate results and make some recommendations for fire fighting.

3. AERIAL FOREST FIRE FIGHTING

Aerial forest fire suppression is the use of aircraft and other aerial resources to combat forest fires. In this study aerial forest fire suppression indicates aircrafts and helicopters.

3.1. Aircrafts

This technology has been introduced first time in 1985 by the Turkish Aeronautical Association in Turkey. Fixed-wing airplanes (4 Dromader) for extinguishing and (1 Cessna) for reconnaissance with a capability to drop 800 to 1000 litre of water.

The first amphibious aircraft used for aerial fire fighting in Turkey in 1996 are 3 amphibious planes of the types CL-215 and CL-415 that were rented from Canada in 1996, and can alight on water and intake water by descending. Later in 1997, 2 pieces and in 2007 3 pieces of CL -215 type aircraft rented again. Between 1997 and 2007, CL-215 type aircraft's given up renting. But they have been used since 2009 in fighting forest fires.

Aircraft types used in the world in the forest fires as follows: P4Y-2, Martin Mars, S-2 E Tracker, C-130 Hercules, Canadair CL-215, M-18 Dromader, Q400, AT-802F, OV-10As, CL-415, and Be-200. In the last years C-130, MI-18, CL-215, CL-415 are the most preferred aircrafts in Turkey (Ay, 2010). Finally, since 2009, CL-215 amphibious aircrafts are in use again.

The aircrafts which can use reterdant are not in use in Antalya Regional Directorate of Forestry, because of their size and lack of ability to move. CL-215 type aircrafts are preferred to forest fire supression in Antalya Forestry Regional Directorate. These type of aircrafts can reserve the foam and it is possible to mix the foam in the air for suppression effectively when needed. The most appropriate aircraft type is CL-415 for Turkey's forests and land conditions but this type of aircraft is very difficult to be found for rent.

3.2. Helicopters

Helicopters can reach from zero to maximum speed in a short time, stand a certain point on the desired height, they don't need a special airport for landing or get off and they can make maneuver to a deep valley. Because of these advantages helicopters are preferred for forest fire suppression.

In 1988, the General Directorate of Forestry has began to use 3 Ecureuil (Squirrel) and 3 Dauphin (Dolphin), all together 6 helicopters, in forest fire reconnaissance and surveillance, personnel and material transport, aerial photographing, carrying sick and wounded, and as well as the fight against illegal forest use. Turkey rented 5 MI-17 helicopter in 1995 from Russia and 7 more in 1996. At the end of 1997, the S-365 Ecureuil helicopter was exchanged by Dauphin types.

Helicopter types used in the world in the forest fires as follows: Bell-47, Alouette III, UH-1 Huey, Bell 205A, Bell 206 Jet Ranger, 210, 212, Scorsky S-58, S-70 Firehawk, 60 Blackhawk, AS350 Astar, Helicopter-64 Skycrane, MI-8, Ericson S-64F, AW-109, Scorsky S-76B, BK117, AS355 EURECUIL, BELL 412, Ka-27 Helix, Ka-32A, SA365 Dauphin 2, AW 139. In the last years AS-355 Ecureul, AS-365 Dauphin, Ka-27 Helix, Bell 212, MI-8 are the most preferred helicopters in forest fires in Turkey (Ay, 2010). Helicopter types, MI-8 and Ka-27 Helix are small helicopters and they are suitable for geographic conditions of Turkey also they prefer around the world for forest fire suppression.

MI-8 helicopter through the net hooks can carry 2.5 tons of water and has a bumbi-bucket under the body, water supply is extremely easy and flexible fort his type helicopter. MI-8 elevations up to 1000 m with a maximum cruise speed of the weight from 220 km / h. This has been MI-8 an effective helicopter for suppression on forest fires. It is an appropriate helicopter type for Turkey's land conditions.

4. CONCLUTIONS

Field studies in Antalya region shows that the pilots are very experienced in forest fire and they know the region well. The pilots in charge of forest fires must be experienced in the forest fires as much as technical teams. Forest fires are very complex and ground teams and aerial teams have to work together in competible. In the field studies it is observed when the helicopters and aircrafts arrived to the fire area, some times other teams are watching aerial supression. But aerial supression has to be supported by the ground teams all the time.

Another observation is about the communication in the fire. Helicopters are renting with their pilots from Russia. Generally the language causes communication problems during the fire supression works.

Success of forest fires under control, depends on between the start of the fire and intervention. Generally, it is observed that within the first 20 minutes interventions are successful. For this reason, the aerial intervention is very important in forest fires, and allows you to reach the fire as soon as possible to intervene. The most appropriate aircraft type should be selected according to their abilities such as rapid maneuver, abilities to fill up water from the nearest water sources and without leaking fire-machine on the fire as quick as possible. Additionaly they should be used for the personnel transport, the sick and the wounded and as well as rescue the people who surrounded by fire.

Helicopters and aircrafts mixes fire reterdants in the air into the water which the water they took from the nearest water source, reducing the speed of progress of fire and it saves time. Indeed, Giménez et al. (2004) also concluded that the long-term forest fire reterdants reduces inflame and the spread of fire. Southern part of Antalya Regional Forestry Directorate is Mediterranean Coast which makes naturally access in short time to fill up the water for the aircrafts and the helicopters.

During the shotting of water or fire retardant, fire workers should be aware of the effect of hard water or broken branch and rolled stones as a result of turbulence. Meanwhile for the safety, personal security measures should be taken to protect the fire workers in terms of fire.

Also, deployment of the aircrafts and helicopters is necessary. It should be determined by taking into account the fire-sensitive areas of the planning.

Aerial forest fire supression is also very expensive method. Turkey is a developing country and the fire manager has to use all resources very economically. For example helicopters can be used for spot fires or their monitoring.

Forest fires have a major impact on the development and sustainability of the Turkish Forestry. Fire researches and policies are generally focused on fire supression technics and total burned area. In the coming years, researchs and policies have to support realistic personel policies and fire prevention land-use policies.

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