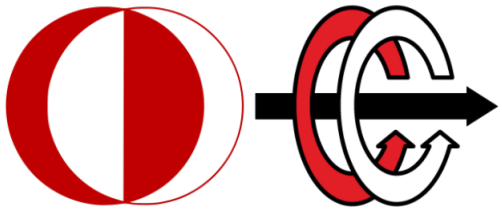

Middle East Technical University

Department of Electrical and Electronics Engineering

EE400 Summer Practice II
Report

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SP Beginning Date:
09.07.2018
SP End Date:
03.08.2018
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TÜRKSAT A.Ş.

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21/08/2018

Contents

1 Introduction

2 Description of the Company

In this chapter, I will introduce the company in five main parts:

2.1 Company Name

ASELSAN A.Ş. or **AS**KERİ **EL**EKTRONİK **SAN**AYİ A.Ş.

2.2 Company Location

ASELSAN has six campuses in Turkey, one of them being in Istanbul, other campuses are located at Ankara. Throughout my summer practice, I spent my time at **Macunköy** Campus.

Address: Macunköy Campus: Mehmet Akif Ersoy Mahallesi 296. Cadde No: 16, 06370 Yenimahalle-Ankara, Türkiye

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2.2.1 Macunköy Facilities

Macunköy Facilities was established on an area of total 186.000 m2, 110.000 m2 of which is the closed area. **General Directorate**, **SST** Group, **UGES** Group and parts of **HBT** and **REHİS** Groups are at Aselsan Macunköy Facilities.

2.3 General Description of the Company

ASELSAN is a company of Turkish Armed Forces Foundation, established in 1975 in order to meet the communication needs of the Turkish Armed Forces by national means. Currently (5,43% of the shares are owned by the Foundation whereas the remaining 15,3% runs in İstanbul Borsa stock market.

ASELSAN is the largest defense electronics company of Turkey whose capability/product portfolio comprises communication and information technologies, radar and electronic warfare, electro-optics, avionics, unmanned systems, land, naval and weapon systems, air defence and missile systems, command and control systems, transportation, security, traffic, automation and medical systems. Today ASELSAN has become an indigenous products exporting company, investing in international markets through various cooperation models with local partners and listed as one of the top 100 defence companies of the world (Defense News Top 100).

ASELSAN, together with the technology emphasis in its vision, has targeted to be a company that maintains its sustainable growth by creating value in the global market; preferred due to its competitiveness, trusted as a strategic partner, and caring for the environment and people.

Together with the highly qualified engineering staff within more than 5000 employees, being the main driving factor of the company's success, ASELSAN allocates 6% of its annual income for self-financed research and development activities.

2.4 The Organizational Chart of the Company

The organizational chart of ASELSAN can be seen in *Figure 1*.

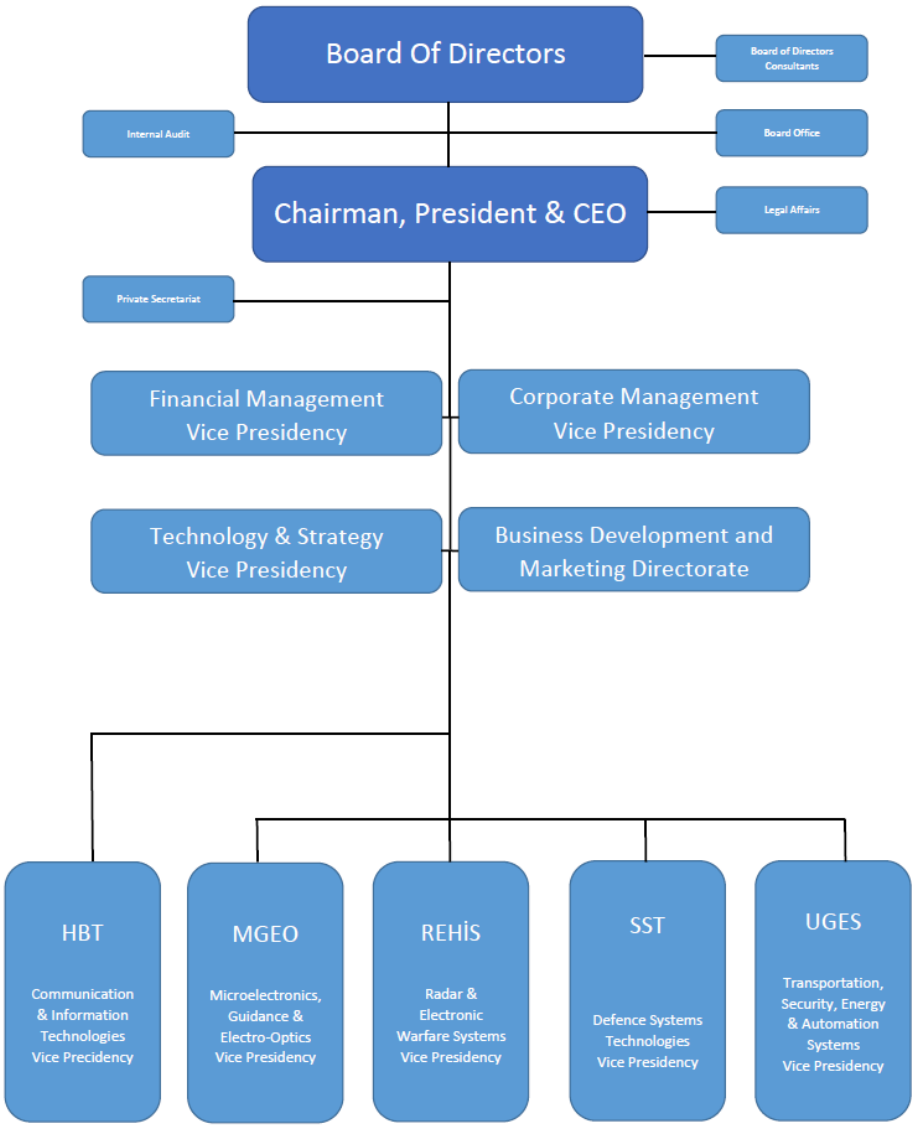

Figure 1: The Organizational Chart of ASELSAN

2.5 A Brief History of the Company

- **1978** : The first premises in Macunköy Facility were completed and the manufacturing operation started.
- **1980** : The first manpack and tank wireless radios were delivered to the Turkish Armed Forces.
- **1983** : The first export was realized.
- **1982-1985** : New products such as Field Telephones, Computer Controlled Central Systems and Laser Distance Measurement Appliances were included in the inventory.
- **1987** : ASELSAN was included in a common project attended by 4 NATO countries for the manufacturing of Stinger Missile and started the required investment for the thick film hybrid circuit production.
- **1988** : ASELSAN produced the first avionic appliance for the F-16 program.
- **1989** : The first technology transfer to Pakistan was realized. Wireless radio production was started with ASELSAN license in NTRC facilities in Pakistan.
- **1990** : On date 21.05.1990, the ASELSAN shares were offered to the public and as of date 01.08.1990, the shares were started to be traded in IMKB (İstanbul Stock Exchange)
- **1992** : The Radar systems were included in the ASELSAN product range.
- **1996** : The TASMUS agreement was executed.
- **1997** : ASELSAN 1919 Mobile Phone was launched to the market.
- **1998** : Thermal cameras, thermal weapon sight and thermal vision devices with target coordination addressing devices were submitted to the use of Turkish Armed Forces.
- **1999** : Agreements for Air Defence Early Warning and Command Control System, MILSIS Electronic Warfare and X-Band Satellite Communication System were executed.

- **2001** : ASELSAN took over 72% of the shares of ASELSAN MİKES A.Ş.
- **2002** : The equity capital of the company increased two and a half times compared to the previous year and reached the level of approximately one fourth of the aggregate resources.
- **2005** : HEWS, Helicopter Laser Warning Receiver system (LIAS) Project and Turkish Land Forces Avionic System Modernization Project was executed.
- **2007** : The construction of ASELSAN Integration Hall Building was completed and settlement activities were realized.
- **2007** : MILGEM war system supply project was executed.
- **2008** : ATAK agreement and Multi Band Digital Common Wireless Radio (ÇBSMT) Project were executed and ASELSAN delivered the first originally developed Air Defense Radar.
- **2009** : In 2009, four Research and Development Centrals were established, Leopard-1 Tank modernization was completed, MILGEM Warfare System 2nd Vessel Project, Ammunition Transfer system Project for Self-Propelled Howitzer (Fırtına- Storm) Ammunition vehicle and SAR / Reconnaissance System Supply Integration Project were executed.
- **2012** : Turkey's first national Air Defense System "Pedestal Mounted Stinger System" which has been designed and produced by ASELSAN, and whose delivery took nearly 23 years, last 5 pieces has been delivered to Turkish Armed Forces.
- **2013** : ASELSAN has continued its climb for the aim of being one of the top 50 defense companies, and ranked 74th according to annual sales.
- **2013** : ASELSAN was the company who has participiated most at the 11th International Defence Industry Fair (IDEF 2013).

3 Orientation and Mandatory Education

3.1 Orientation

3.2 Mandatory Education

3.2.1 Electrostatic Discharge (ESD) Education

Electrostatic discharge (ESD) is the sudden flow of electricity between two electrically charged objects caused by contact, an electrical short, or dielectric breakdown. A buildup of static electricity can be caused by tribocharging or by electrostatic induction. The ESD occurs when differently-charged objects are brought close together or when the dielectric between them breaks down, often creating a visible spark.

ESD can create spectacular electric sparks (lightning, with the accompanying sound of thunder, is a large-scale ESD event), but also less dramatic forms which may be neither seen nor heard, yet still be large enough to cause damage to sensitive electronic devices. Electric sparks require a field strength above approximately 40 kV/cm in air, as notably occurs in lightning strikes. Other forms of ESD include corona discharge from sharp electrodes and brush discharge from blunt electrodes.

ESD can cause harmful effects of importance in industry, including explosions in gas, fuel vapor and coal dust, as well as failure of solid state electronics components such as integrated circuits. These can suffer permanent damage when subjected to high voltages. Electronics manufacturers therefore establish electrostatic protective areas free of static, using measures to prevent charging, such as avoiding highly charging materials and measures to remove static such as grounding human workers, providing antistatic devices, and controlling humidity.

ESD simulators may be used to test electronic devices, for example with a human body model or a charged device model.

3.2.2 Occupational Safety and Health (OSH) Education

Occupational safety and health (OSH), also commonly referred to as occupational health and safety (OHS), occupational health,[1] or workplace health and safety (WHS), is a multidisciplinary field concerned with the safety, health, and welfare of people at work. These terms also refer to the

goals of this field,[2] so their use in the sense of this article was originally an abbreviation of occupational safety and health program/department etc.

The goals of occupational safety and health programs include to foster a safe and healthy work environment.[3] OSH may also protect co-workers, family members, employers, customers, and many others who might be affected by the workplace environment. In the United States, the term occupational health and safety is referred to as occupational health and occupational and non-occupational safety and includes safety for activities outside of work.[4]

In common-law jurisdictions, employers have a common law duty to take reasonable care of the safety of their employees.[5] Statute law may in addition impose other general duties, introduce specific duties, and create government bodies with powers to regulate workplace safety issues: details of this vary from jurisdiction to jurisdiction.

4 Work Done at SP Company

4.1 Mechanical & Electrical Tests of ASELSAN 9661 Radio Family

4.1.1 ASELSAN 9661 Radio Family

The 9661 HF Radios are a new generation Software Defined Radio covering the HF 1.6-30MHz band. Software configurable architecture enables supporting various radio waveforms and EPM techniques. Beyond line of sight communication is made possible based on the latest HF technology via use of NATO STANAGs and Military Standards. The versatility of waveforms and modes enable communication even in the most hostile HF channel conditions. With the use of technologies such as Automatic Channel

Selection (ACS) and Automatic Link Establishment (ALE), ease of use is provided while reducing the need for well-trained and experienced operator.

The radio has embedded Built-In Digital Modem. Modem functionalities in the Software Defined HF Radio are implemented based on several NATO STANAGs and MIL-STD's. While voice and data can be transmitted over a preset fixed frequency, it is also possible to employ an Automatic Channel Selection mechanism which determines the usable frequency for communication. It is possible to communicate under intentional or unintentional interference by using frequency hopping mode of operation.

9661 HF Radio built-in modem (physical layer) includes Digital Data Waveforms, Automatic Link Establishment and Frequency Hopping. USB, LSB, ISB, AME, AM and CW modulations are supported through 9661 HF Software Defined Radio.

Digital voice coding/decoding is performed with MELPe vocoder and the data rate for digital voice can be 600, 1200 or 2400 bps. Digital voice communication over fixed frequency can be encrypted. Data communication over fixed frequency can be encrypted or clear. Frequency hopping is the Electronic Protection Measure (EPM) for transmission of digital voice and data.

9661 HF Radio family has three configurations for Manpack, Vehicle and Fixed Station usage. 20W can be used for Manpack and Vehicle configurations and 150 W can be used for Vehicle and Fixed Station configurations.

4.1.2 Electrical Equipments

4.1.2.1 RF Attenuators

4.1.2.2 Modulation Analyzer

4.1.2.3 EXA Signal Analyzer

4.1.2.4 Power Reflection Meter

4.1.2.5 (UPV) Audio Analyzer

4.1.2.6 Signal Generator

4.1.2.7 Analog Signal Generator

4.1.2.8 Vector Signal Generator

4.1.2.9 Signal & Spectrum Analyzer

4.1.2.10 Digital Phosphor Oscilloscope

4.1.2.11 Synthesized Signal Generator

4.1.2.12 3920 Digital Radio Test Set

4.1.3 Test Stand

4.2 Outer Space Simulations & Tests using TVAC

4.2.1 Thermal Vacuum Chamber (TVAC)

4.3 Mechanical & Electrical Tests of ULAK 4.5G Macrocell Base Station

4.3.1 ULAK 4.5G Macrocell Base Station

Based on Release 10 and Release 11 standards published by 3GPP, ULAK Macrocell Base Station is designed to support both Release 12 and Release 13 standards with flexible architecture that is open to software development without any hardware changes and is designed to work on different frequency bands for use in Commercial or Public Safety networks.

To enrich the product portfolio; the following studies are currently carried out:

Integration of LTE-A to Narrowband Communication Systems, LTE-Advanced Mobile Terminal Safety Software With the development of 4.5G

Communication Systems, it is aimed to meet the need of fast, secure and continuous communication of both mobile operators and public institutions.

4.4 Research on Components of ULAK 4.5G Macrocell Base Station

4.4.1 Alternate Components

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Figure 2: —— ——

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Table 1: ——

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5 Conclusion

I completed my summer practice in ASELSAN A.Ş.(ASELSAN Electronics Industry and Ticaret A.Ş.) in Yenimahalle/Ankara. It was quite experiential time for me. Throughout my summer practice, I learned many things about professional work life. Firstly, I witnessed

Finally, I recommend my summer practice company for other students.

6 References

[1] Raspberry Pi 2 & 3 Pin Mappings, https://docs.microsoft.com/en-us/windows/iot-core/learn-about-hardware/pinmappings/pinmappingsrpi

[2] Temurtas Halil, *Sun Tracker System*, Bitbucket repository,(2017), https://bitbucket.org/temurtas/pi/