UNISON-Egypt: a look into space education future

Egypt/Africa
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Space Systems Technology Laboratory (SSTLab) is a student based organization at Aeronautical and Aerospace Engineering Department, Cairo University, which was established in August 2011. SSTLab share the same vision and mission of UNISEC. SSTLab prompt the project-based space education by conducting a series of CanSat Training Program Courses (CTPs) and participate in both national and International competitions. Last year, the fourth CanSat Training course (CTP4) was organized to about 12 students in the period from January 15 to January 28, 2014. SSTLab also participated the 3rd Iranian CanSat Competition and

Figure 1 SSTLab slogan

achieved the 7th, SSTLab also have its Rover Back CanSat project running since 2011. This rover back CanSat also, participated in the 3rd Iranian CanSat Competition for the open class mission category and won the 5th place, also was awarded for its' smart mechanical design,

Figure 2 CanSat Training program CTP4

Figure 3 Iran CanSat Award for the most Respectful team for CanSat and Rover back

Another categories of space rovers is called "Lunar Rovers", this year, June 2014, SSTLab made its' first prototype and won the 9th place at URC (University Rover Challenge Competition) which is held in Mars desert station, Utah in USA, Quad-copters also are developed and manufactured in the laboratory, this year and after some prototypes SSTLab managed to make a full autonomously stable Quad-copter.

Figure 4 SSTLab first Mars rover Prototype participating in "URC"

Another more advanced running project in the laboratory is the "CubeSat", This year (2014) is considered to the third development iteration which was originally started in 2008 and the second one in 2013, In 2013, CubeSat Participated in (EED) "Egypt Engineering Day" the largest B.Sc. Engineering Student exhibition in Egypt and won the first place in "computer engineering", The cube-satellite project focuses on one major aspect which is the use of low-cost

Figure 5 SSTLab First CubeSat

components of the shelf (COTS) and utilizing novel computing systems. The 1U structure is made using low-cost traditional machining of aluminium alloy, with similar purity to those commonly used in cube-satellites, shown in Figure 5. Electric Power Subsystem (EPS) is designed to support various voltage needs of the Cube-satellite subsystems out of 3.7V batteries, including switching and power management within a mission scenario for maximum sustainability. For communications, efficient it uses the physical interfaces by only utilizing the audio ports, creating a virtual TNC on the on-board Computer (OBC) using

Figure 6 SSTLab Receiving the first place award for Computer Engineering in Egypt Engineering Day (EED)

protocols as Slow Scan TV (SSTV) for image transfer, Audio Frequency Shift Keying (AFSK) for binaries transmission, and Dual Tone Mutli-Frequency (DTMF) for data frames designations are accomplished, shown in Figure 7, as well as audio manipulation for image transmission time reduction, and an automated ground-station solution with incoming data recognition.

This year the propulsion team in the laboratory did a great effort developing its' own Aluminium-Potassium-fuelled Solid rocket engine and achieved a high power to weight ratio to be a possible CanSat launchers. In the next year, SSTLab seeks to increase its' ability and capacity to get more and more students to its' project-training programs, as the laboratory got more good reputation in Engineering-based universities, it seeks to held a local events in various universities and schools to call the students to participate in the working area and open branches of the lab in these universities to serve the same target under the supervision of the global UNISEC, SSTLab also have the ability to share its' knowledge and experience with the foreign universities and institutions, it can provide trainings such as CanSat and Rover Back CanSat with others in an organized exchange-program under the UNISEC-Egypt supervision.

Figure 7 SSTLab Second Cubesat Prototype

It's known that Space industry is a high-cost one, so, SSTLab have its' own fundraising team which work to cover its' Expenses, as the laboratory receives limited governmental support, it seek to get more support from the private sector, last year the laboratory managed to get a support from private institutions, next year, SSTLab plans to get support from some of the international space-based institutions which, unfortunately, don't have a local branches in Egypt, anyway, as SSTLab knows it's role being UNISEC-Egypt contact point, it's required to share the difficulties that were faced; in a few years the laboratory seeks to launch its' first cube satellite in to the orbit for the planned mission, Unfortunately, there's no rocket launchers were developed in the laboratory to do such a mission yet, another difficult that, testing a rover back or a CanSat requires a high altitude rocket launcher in order to fully test all subsystems, yet, SSTLab don't have launchers except for some water rockets which don't exceed the range of few tens of meters.

As mentioned bove "Space System Technology laboratory" has made great steps towards its target to prompt the project-based space education,

Figure 8 SSTLab solid rocket engine tests

during the last four years SSTLab built its' reputation and trust. (End)