Space Programme for Pupils and Teachers

Zdenek Kluiber
Pedagogical Faculty of University Hradec Kralove, Hradec Kralove & Faculty of Biomedical Engineering, Czech Technical University, Kladno, Czech Republic – Marie Drosslerova, Medical Faculty of Masaryk University, Brno, Czech Republic.

E-mail: zdenek.kluiber@email.cz

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Abstract

In this article the information about teacher's and pupil's participation in the International Space Camp in USA and pupil's participation in the European Space Camp in Norway is brought. Both events offer its participants a detailed introduction to main areas of preparation for future astronauts and spacecraft construction.

Keywords: space camp, space shuttle, rocket, astronaut's training.

Resumen

En este artículo presentamos información acerca de la participación de profesores y alumnos en el Campo Espacial Internacional en EE.UU. y también la participación de alumnos en el Campo Espacial Europea en Noruega. Ambos eventos ofrecen a sus participantes una detallada introducción a las principales áreas de preparación de los futuros astronautas y la construcción de naves espaciales.

Palabras clave: Campamento espacial, lanzamiento espacial, cohetes, entrenamiento de astronautas.

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I. INTERNATIONAL SPACE CAMP FOR PUPILS AND TEACHERS

U. S. Space & Rocket Center, Huntsville, Alabama was founded in 1970. In 1982 the tradition of the "International Space Camps" (ISC) was set here; an intensive education of American and foreign teachers - especially secondary school teachers - for their preparation to teaching historical but also current knowledge from astronautics, astrophysics and narrow binding of all linked subjects and scientific disciplines. Together with foreign participants American best teachers from all the USA states are here. Generally these people meet here together: foreign delegations - 1 teacher, 2 pupils under 18 years old (success in a selective competition is required for the participation) - from about 30 countries, 50 teachers from the USA, about 15 pupils from the USA who are under 18 years old.

In July 2007 in anniversary 25th ISC there were 22 foreign delegations: Australia, Belgium, Canada, China, Costa Rica, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Korea, the Netherlands, New Zealand, Norway, Portugal, Russia, Singapore, Switzerland and Turkey.

The delegation of the Czech Republic consisted of: Assoc. Prof. RNDr. Z. Kluiber, PhD. & PhD. pupils: M. Drosslerova (Mendel Grammar School, Opava) and Tomas Pejchal (Grammar school, Zdar nad Sazavou).

Five teachers' and five pupils' international teams were made and these passed special programmes.

The whole eight days special programme - financed by NASA and Coca-Cola foundation - began in the presence of NASA and U. S. Space & Rocket Center high representatives with a cultural-social presentation of foreign delegations and American teachers and pupils.

II. EDUCATION PROGRAMME FOR TEACHERS

The contents of the "Education Programme for Teachers" - especially for the KIBO team (Japan word for hope) - which consisted of teachers from the USA, Russia, Austria, Greece and the Czech Republic:

1. Creation of the team, activities, U. S. Space & Rocket Center structure.
2. Particular positions for the space shuttle mission - activity, tasks, displacement.
3. Motion picture - American astronauts' air training.
4. Mrs. Grace Corrigan's speech - mother of astronaut Christa McAuliffe, information about the publication "A Journal for Christa" [1]. Christa McAuliffe is nowadays intended to be in some sense a national heroine. Her mother - speaking in NASA suit - is a link element for the future, in these intentions she spoke to teachers and towards their influence on pupils.
5. Conception of the space shuttle mission - preparation, implementation, function.

6. Discovery space shuttle mission training - familiarisation with work sites, tasks.
7. Mars research - detailed information, University of Arizona, perspectives.
8. Discovery space shuttle mission simulation - space station research worker role - physical and chemical experiments: properties of polymers, absorption of liquids, surface properties of metals.
9. Space shuttle flights history, visitation of the U. S. Space & Rocket Center museum - Mercury, Gemini, Apollo, Mir, Eagle, space shuttle, International Space Station (ISS).
10. Meeting NASA top managers' and specialists' families.
11. Meeting Dr. Wernher von Braun's team members - remembrance of president J. F. Kennedy.
12. Space research in the Solar system - preparation for Pluto research.
13. Cosmic module water surface landing training - fall of a module into the sea, leaving a module.
14. Cosmic geology - planets' positions.
15. Meeting "The Real Space Cowboys" [2] author Ed Buckbee, historical information about first 7 American astronauts - team Mercury: Scott Carpenten, Gordon Cooper, John Glenn (originally untouchable person for further space flight - finally flew for the second time in STS-95, Discovery, 1998), Gus Grissom, Wally Schirra, Alan Shepard, Deke Slayton.
16. Information about Apollo research project.
17. Endeavour space shuttle mission training, STS-118,
Note: on 7th August 2007 there was Barbara Morgan in the Endeavour space shuttle crew; Christa McAuliffe's substitute who was asked by NASA for further cooperation. A pedagogical block was a part of scientific programme of the mission.
18. Mathematical activities - combination tasks, operationality.
19. Astronaut Story Musgrave's speech.
20. USA future space research - details about ORION and ARES – visions.
21. Living and work in space - laboratories, accommodation, catering, sanitary facilities, work activities.
22. Endeavour space shuttle mission simulation - trying to manage some analogy of experiments made by Barbara Morgan.
23. Connection of design and function of facilities - thermal shielding, experiments.
24. Astronauts' physical training - simulations: 3D flip-flap, walk on an "elastic rope".
25. Common phase of preparation for ARES - construction, parameters and their values, concretization.

A panel lecture was a very suggestive event - a discussion of six specialists who arrived to the USA together with Dr. W. von Braun as 107 member group from Germany after WWII, who were in his team. Their greatest success was the SATURN V rocket and the common space shuttle too. They were born in the 20th century, they are about 95 years old: Konrad Dannenberger, Axel Roth, Georgie Hopsan, Ernst Stuhlinger, Alex A. McCool and Walter W. Jakobi.

Ed Buckbee's lecture - or his book's presentation [2] respectively - was eminently profitable. It was a set of first-hand personal experiences. And W. von Braun was the man who established him to be the 1st director of the U. S. Space & Rocket Center in 1970.

Some certain finale of personal meetings was a lecture of Dr. Story Musgrave. The man who flew six times in a space shuttle - the only astronaut who has ever flown in all American space shuttles, he graduated 6 universities, has written 25 scientific works and he represents one of the most important legends of American space programme.

The daily schedule was quite demanding: specialised programme started at 8 a.m. and finished at about 10 p.m. The KIBO team's work was conducted by two holiday instructors - secondary school teachers of mathematics, physics and English.

III. EDUCATION PROGRAMME FOR PUPILS

Pupils from the Czech Republic were very well prepared for participation in the ISC - they had both language and scientific knowledge. In their preparation they focused especially on set of knowledge - American and world astronautics, general overview of space research, English language and improvement of improvisation and fast response. Pupils passed through a very demanding programme in teams - a simplified analogy of the teachers' programme. They tried on feelings at 4G - Space Shot. The most prominent lecturers of pupils were G. von Tiesenhausen, W. von Braun's team's member and co-builder of the SATURN V rocket, astronaut S. Musgrave and astronaut M. Mullane. During their programme they tried on training on the moon walk simulator, uncontrolled rotation, microgravity in eight metres deep water reservoir, drive "on the Moon" or visit to the space museum.

Even for pupils the programme's climax was a space shuttle mission, ISS mission or mission in the control centre respectively.

IV. SPACE EXHIBITS

During last ten years series of important changes happened in the U. S. Space & Rocket Center area: *1.* Ten years ago the SATURN V rocket in horizontal position was really impressive exhibit—now the SATURN V rocket is in outstanding vertical position and it is a real dominating feature of whole space centre, naturally with memorable PATHFINDER spacecraft. *2.* An attractive "Space Shot" has been relocated near to main experimental and official building. *3.* Simulation work sites have been substantially extended - partly the space shuttle, partly the ISS; a lot of real instruments and devices from a space shuttle were installed, simulations "expressively correspond" to work of real American astronauts. *4.* Two new huge vestibules for exhibits and experimental activities are under

construction. *5.* Educational centre operates in newly built very large building - auditorium, educational hall, storages, library, work room for lecturers, EC centre, scientific laboratories, seminar rooms, lecture hall. *6.* Newly utilized information panels have been installed near the exhibits shown. *7.* The "Solar system" educational footpath has been established. *8.* "Human on the Moon" NASA mobile exposition has been constructed. *9.* New equipment of training areas has been installed - training climbing cliff, space shuttle flight simulators. *10.* The museum section has been enriched by a simulator of driving vehicle on Mars's surface. *11.* Number of shops and goods offered has increased. *12.* The centre's programme includes more programmes for public - e.g. FAMILY - parents with children, holidays courses etc.

V. MODERN EDUCATIONAL ASPECTS

Lectures and seminars brought very valuable background materials for new conception of astronomy and physics education. In this context we may say that into common key problems of didactics of physics we can include following things:

1. An adequate didactical processing of so-called "clip television information" - pupils receive knowledge in a fast form and they keep them in memory.
2. An adequate conception of teaching electronics and electrical engineering, or related basics of physics respectively, is missing.
3. Traditional educational unit - school lesson - must be transformed into new time schedule - as a consequence of influence of media.

The interesting thing is that in all American astronauts' biographies, which we obtained as study materials, particular foremost passages give us accurate information about secondary school they graduated! Everyone who was in the ISC attached big importance to it!

Booklet dedicated to important astronauts are namely assigned for American secondary school pupils.

America's best teachers of the year obtain as a reward from government precisely the stay in the U.S. Space & Rocket Center in the international "Education Programme for Teachers". In 2007 the USA teacher of the year became Andrea Peterson, Washington. All these best teachers got audition in White House by USA president G. Bush. There is big effort to improve far more the quality of teachers' position and heightening the reputation of teachers' occupation.

VI. PERSPECTIVES OF AMERICAN SPACE RESEARCH

The huge accent lays on preparation, on training. As well as there must be everything properly trained for space shuttle's flight - the preparation takes about 15 months - it is necessary to discuss significant activities with pupils into detail: analyse the result, display the faults and positives, repeat the process, evaluate.

Perspectives or tasks for American space research are very rich. This means especially the ISS, production of new spacecrafts - to Moon and Mars, coming back on the Moon, creating new solar sources of energy, production of high-quality robots, health securing of the voyage to Moon and Mars and of astronauts' stay there, applying economical usage of research results etc. New space transportation devices - ORION and ARES rockets (new SATURN V) - are supposed to utilize the positive knowledge from the Apollo project and space shuttles - this means solid fuel engines and liquid fuel tank. The first phase counts on about 160 days of voyage towards Mars and about 500 days of stay. So the new space programme introduced by president G. Bush on 14th January 2004 is intensively implemented.

VII. EVALUATION OF INDIVIDUALS AND TEAMS

Work of all teams, teachers and pupils as well was evaluated in detail. Everyone obtained a certificate of absolving this prestigious event, so valuated in the USA.

One best participant from every teachers' team was chosen, American who obtained another reward in form of two flight tickets to destination of his own choice from DELTA Air Lines.

VIII. EXPERIENCE FROM EUROPEAN SPACE CAMP

In June 2008 M. Drosslerova in some sequence of the ICS participated in the European Space Camp (ESC) in Norway. About her stay she says:

"ESC is situated in Andøya Rocket Range, which lies 69 degrees north in Norway. Young pupils from all over the world become rocket scientists for one week, meet a lot of interesting people, enjoy social activities and swimming in the midnight sun. Because you represent your country, a selection of participants is really complicated. Candidates should have the main interest in rockets, physics and mathematics. But grades, activities, diplomas and a letter of recommendation play a very significant role too. ESC is supported by organisations as European Space Agency (ESA), National Centre of Space Related Education (NAROM) or Norwegian Space Agency, so participants pay only air tickets to Norway and their stay in ESC is covered by supporting organisations.

ESC 2008 took place from 22nd to 30th June, there were 26 participants from 8 countries (Australia, Czech Republic, England, Germany, New Zealand, Norway, Poland, Sweden). I cooperated with Dr. Zdenek Kluiber and I was selected as a participant. I spent one week in experimental society, I was treated as a rocket scientist led by skilled personnel. The main task of the ESC was to build a rocket and to launch it successfully. For this

purpose we were devided into 5 groups. The group of Rocket System Design was responsible for all pre - flight tests of the rocket, simulations and special calculations. Pupils, who were in the group of Experimental Instrumentation, constructed a circuit board for sensors of the rocket. The Rocket Payload Assembly group took care of a payload, which was a part of the rocket and contained the instruments including e.g. a transmitter with antennas, because we evaluated data during the flight of the rocket. The group of Rocket Telemetry was charged with responsibility for all the surveillance of the rocket flight, signal and data. I was in the group of Rocket Physics. This group released a scientific balloon, because of weather conditions for our rocket. We analysed data, measured weather conditions and used simple equations, studied atmospheric physics and worked with new knowledge during the countdown, because we were responsible for weather conditions. We launched our rocket called VEGEMITE without any huge problems, the maximum flying high of VEGEMITE was about 9400 meters (30839,90 feet). Of course, we attended a lot of lectures including lectures: Plasma Universe, Rockets and how they work, Rocket Aerodynamics, Rocket Trajectories, ESA - Opportunities for pupils, Atmospherics Physics and Discoveries at the CERN. The most important thing is that we worked in a team, we learned about different cultures. We were a true team without any doubts. Team Space Camp appreciated us greatly, because we spent an amazing day on Whale Safari. We got useful diplomas and a huge motivation for our future studies. This camp was an unforgettable experience for me".

CONCLUSION

Participation in "Education Programme for Teachers" in U. S .Space & Rocket Center allows you to obtain set of information and knowledge from astronautics - about its perspectives, teacher's work, didactics of astronomy and physics, astronautics. And also for pupils the teamwork is really important, and so rules of cooperation, coordination of team members are too. This was proved and significantly deepened by participation in ESC:

REFERENCES:

[1] Corrigan, G. G., *A Journal for Christa* (University of Nebrasca Press, 2000), p. 191.
[2] Buckbee, E. – Schirra, W., *The Real Space Cowboys* (Apogce Books, Burlington, 2005), p. 168.