

Increasing the visibility of the helicopter and aviation industry among 13-19 year olds,

utilizing the First Lego League network with a reach of over 40,000 groups worldwide.

Problem statement:

Foreseeable shortage of pilots, engineers, and aircraft mechanics / similar shortages in other industries

Objectives:

Inspiring children and young people to pursue careers in technology, helicopters, and skilled trades

Mitigating the shortage of young talent in technical professions.

Resources:

A fascinating, tangible subject. Thoroughly considered in terms of technical, human-physiological, economic, ethical, and social aspects.

Podcasts that address aviation topics relevant to people's everyday lives.

(MRO) apprentices, engineers, private pilots, and helicopter companies who can present these topics in schools and universities.

Networks such as:

„Digitale Drehtür“ (<https://digitale-drehtuer.de/>), an (German)online platform for connecting science and education.

First Lego League / Lego Challenge, which offer access to a broad base of people interested in technology, competition and social values.

School internships:

Girls' Day, Boys' Day, as a way to reach students

Perhaps other industries have similar concerns about attracting young talent and a need for engineers/technicians (automotive, mechanical engineering, could engage themselves to teach CAD/CAM or programming CAN-Bus),

A suggested solution:

Increase participation in the 13-19 age group through simulator clubs in schools. Supported by the First Lego League network, which reaches more than 40,000 groups worldwide.

A **First Lego League** team consists of a supervising teacher/tutor and approximately 4-8 students who independently familiarize themselves with the subject matter. They research, develop, and consult experts (the students will approach the industry so companies should be prepared for this.).

Use the off-season of Lego challenges (approximately 6 months a year) to construct flight simulator seats.

(Take the FlightGear simulator for €0, a "basic developer kit" Arduino board + "Arduino Joystick Library" software, Hall sensors and magnets, potentiometers, pushbuttons, Cyclic grips are available as a 3D printing template in a scaled-down version for children's/teenagers' hands, provided by the industry.

Lego's advantage here is that prototypes can be quickly tested for ergonomics and functionality (e.g., avoiding knee leverage effects on the pedals). The software can also be tested on Lego components before combining all the components into a mock-up.

Greater precision was achieved with ball bearings (608 – as is common with skateboards, with a 22mm outer diameter and an 8mm inner diameter, and a depth of 7mm). Printable files can be generated for these bearings, allowing Lego-compatible bricks to be used. Hall sensors can also be integrated into printed Lego "bricks." 8mm shafts and threaded rods are inexpensive, and ball joints are readily available on Amazon for a small price. Gears or pulleys can be printed as desired and flanged to the basic structures.

Later, a larger, more stable, and expandable version made of wood, aluminum profiles, or similar materials is planned, which will be able to fulfill further tasks.

Students learn:

Project work, programming languages for industry standards such as CAN-Bus systems, CAD and CAM, and crafts like welding, turning, and milling.

Local carpenters and mechanics can help, and upholsterers can assist with reupholstering seats.

Perhaps inter-school collaborations can also be developed (for example, vocational schools could weld frames).

Then, in a competition (similar to Lego challenges), designs for control elements (collective, pedals, cyclic) can be awarded prizes.

The teams use seats of their choice, design the controls around them, and read the inputs using the Arduino kit – thus controlling the FlightGear simulator software.

Examples of design tasks:

- Creating foldable control elements for laptop bags for minimal cost – a hit at upcoming helicopter trade shows ;-)

- Connectable seats for teacher-student setups.

- Force trim and release, -Mechanical beep trim, -Simulate beep trim using stepper motors and spring return using stepper motors.

- Link seats in LAW/WAN or via internet, so that "South Africa can fly in one cockpit with Chile".

- Program the throttle control as a mechanical loop with actuators and sensors into the simulator.

Which subjects can build on this?

Math, Physics:

...of course (Navigation Challenge: calculating courses, bank angle, and torque, and competing against other teams -> students then fly the given route, or precision/deviation from the desired flightplan could be scored, if they are only allowed to fly precalculated parameters...)
Didactic physics experiments can also be developed in-house (not purchased from expensive suppliers)

Linguistic considerations:

Why are command languages (radio, fire department, etc.) not prosaic – what are their characteristics?

Or discussing the ballad of "Nis Randers" as a starting point for (sea) rescue.

Ethics/Religion or Social Studies:

CRM (can we afford to exclude parts of society? - Lego challenges thrive on team integration, which is an award-winning competitive aspect),

51% rule,

What is ethically justifiable in the case of a "rescuer lowered by winch and engine failure" according to which ethical premise?

PTSD: How do I recognize it, and how do I cope with traumatic experiences?

Geography:

Weather forecasts – interface with agriculture, disaster relief, sailing
Flight planning, inadvertent meteorological conditions, density altitude...

Sports:

Competitions where flight plans/routes have to be calculated and flown – precision is scored.

Derived from this: Human performance, aeronautical decision-making

– Don't drink and drive / Fatigue and performance. – how precision decreases during flight.

Cockpit ergonomics (Why is it beneficial to rotate the cyclic a few degrees counterclockwise?)

Art:

Advanced courses can integrate their architectural models into scenery
Design landscapes and fly through "model housing developments"

Music:

See Stockhausen's Helicopter Quartet

History/Social Studies:

Valerie Andree and air rescue or Marie Marvingt – as examples for gender equality.

The big scale – an interdisciplinary event:

Why not organize a "Blue Light Day" where students in their classes/courses contribute specific aspects of a rescue scenario, highlighting:

Weather forecasting by geography students,

Flight planning with weights, paying attention to the aircraft's performance parameters,

Approach to the landing site (What are the requirements, how well is it illuminated at night, which obstacles must be avoided at all costs – see note below),

Rescuing a trapped person (e.g., fire department/THM demonstrates),

Police secure evidence – braking distances, reaction time, influence of alcohol or fatigue?,

First aid demonstration or as a hands-on activity,

HEMS takes over, inquiry as to which hospital can accept the patient, who will transport the patient overland to the hospital, a change in weather complicates the departure route with increased weight, weather forces an alternative hospital (considering fuel consumption)...

Thus, within the overall context, each school subject would gain its weight as a sub-aspect.

Volunteer fire departments/THM (Technical Assistance for Mining, Hazardous Materials) could also be trained to work together, e.g., in selecting fire engines and providing illumination under night vision device (NVG) conditions.

Industry initiatives:

Apprentices from Bell, Leonardo, Airbus, and Robinson can:

- Assemble "basic developer kits" and test their functionality.

- Program realistic helicopter flight models using a Flightgear simulator

and further develop them so that in-flow roll, blowback, and vortex ring functions work.

- Design and publish control elements (e.g., scale down handles in a smaller form for children).

- Enter the design competition with teams (perhaps even just against each other).

- Give physics and flight instruction lectures on helicopters as webinars.

I believe "Leonardo" has already initiated youth outreach through webinars and is reaching Italian

schools with aviation-related topics.

-Offer online flight school courses – as video tutorials or coaching via webinars would also be possible in small groups.

-Provide teaching materials from pilot training to schools for use in their lessons.

.... that's it, for the moment.

I would personally appreciate:

Exchanging ideas with designers, pilots, HEMS personnel, MROs, and LEGO A/S and the opportunity to later involve them in the school project via video conference.

Teaching materials for the project (books from the pilot training curriculum).

Best regards

and remember:

A mind is like a parachute, it does not work, if it's not open.

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