Silesian University of Technology

CALLING ALL CREATIVE STUDENTS!

Faculty of Automatic Control, Electronics, and Informatics

Virtual reality media

Application of Augmented Reality in Aviation and Space Technology

1. The goals of the competition are:

- activation of pupils and students
- exploration of innovative ideas created by young people
- encouragement of young people in innovative approaches to undertaking
- to assist young people in the realization of their passions and interests
- to involve pupils and students in research programs
- the promotion of the WirhgtBros project among pupils at high school education levels as well as University students.

Eligibility/Rules

*Participants must be over 18 years old,

*Participant must be a university student or high school Pupils,

*One work per person,

*Each work should have only one author,

*All components of the submitted work should be the property of the author.

2. The Task

The participant's task is to create and present a concept of the application of augmented reality in aviation or space technology.
Augmented reality is an interactive experience in which real-life objects are mixed with virtual ones.
A person, the subject of augmented reality, can see objects from real life as well as virtual ones (that are overlayed on real-life space) in a common space. These virtual objects are models that can be either high-level symbolic pictograms or detailed 3D models that are difficult to distinguish from real-life objects. Usually, the user can interact with virtual objects with gaze, gestures (hand gestures/touching virtual objects), and sound commands. Devices that allow obtaining AR are cutting-edge pieces of technology that combine current advancements in computational devices, visualization technologies, ergonomics research as well as artificial intelligence.
Among various sets that allow obtaining AR, the WrightBros project is currently based on Microsoft HoloLens2. It is one of the most advanced and robust AR sets available on the market.

Image of HoloLens 2

3. Grading System

Organizers will establish Competition Committee.

Each member of the consortium (Silesian University of Technology, Virtual Reality Media, LgNexera) will designate one representative that will become a committee member.

There are three categories that will be taken into account during grading:

- Originality of the concept (0-10 points)
- Clarity and the quality of the presentation (0-10 points)
- Impact of the proposed solution (0-10 points)

Each committee member will grade the works submitted by the contestants independently. Each contestant will be able to obtain up to 90 points per presentation (up to 30 points per committee member).

4. Timeline

5. Work submission

Work should be sent to the following email address: wrightbrosh2020@gmail.com.

In case of presentations/movies/documents that are greater than 10 MB, please use a file transfer service such as OneDrive / Google Drive, etc.

There is a broad range of forms of presentation of the concept of application of augmented reality allowed in the competition, for example:

- Presentation
- PDF documentation
- Movie
- HTML web page

Organizers of the competition do not enforce the way of the concept presentation as mentioned above, forms are examples and other types of work presentation will also be accepted. Each submitted work should have the title as well as an acronym.

Sending the work for the competition is tantamount to consenting to the use of the submitted work by the competition organizers for the purposes of promotion (e.g. on the project website, in promotional materials) of the project and reporting to university and European institutions. The submitted work may be used in its entirety / in a shortened form / in a modified form. The prerequisite for the acceptance of the work for the competition is a written declaration of the author (in the form of a signed scan) in which he agrees to the publication of the e-mail address from which the work was sent. All published works will have the author's email in a visible place.

6. The prize

For the first three places

One day of training on professional FNPTII flight simulator localized in Virtual Flight Laboratory at the Faculty of Automatic Control, Electronics, and Informatics at Silesian University of Technology (Gliwice, Poland).
During the training, aspiring pilots will be familiarized with:

- take-off procedure
- landing procedure
- Plane steering/turning/speed and altitude control
- Autopilot management
- Airport traffic circle maintaining

Accommodation, for the training period, in Gliwice.

Virtual Flight Laboratory

Virtual Flying Laboratory (VFL) at SUT is an exceptional interdisciplinary laboratory, where cutting-edge technologies from aviation are combined with the newest trends in ICT, especially, virtual reality and visualization, and satellite navigation systems GNSS. VFL is co-financed by European Union from the European Regional Development Fund within the Project considered a winner among more than 100 others in Silesia, the most industrial region in Poland.
When VFL gets finished (in June 2011), it will be equipped with 14 professional flight simulators, including full-size cockpit simulators.
Two cockpit simulators: ELITE Evolution S812 and ELITE Evolution S923 equipped with 3 channel visualization technology, are compliant with JAR STD 3A (Evolution S923 is additionally capable for MCC); Two others, are manufactured by FLYIT (FAA approved: PHS for helicopter and PAS for aircraft), are installed in mobile classroom platforms with heating and air condition.

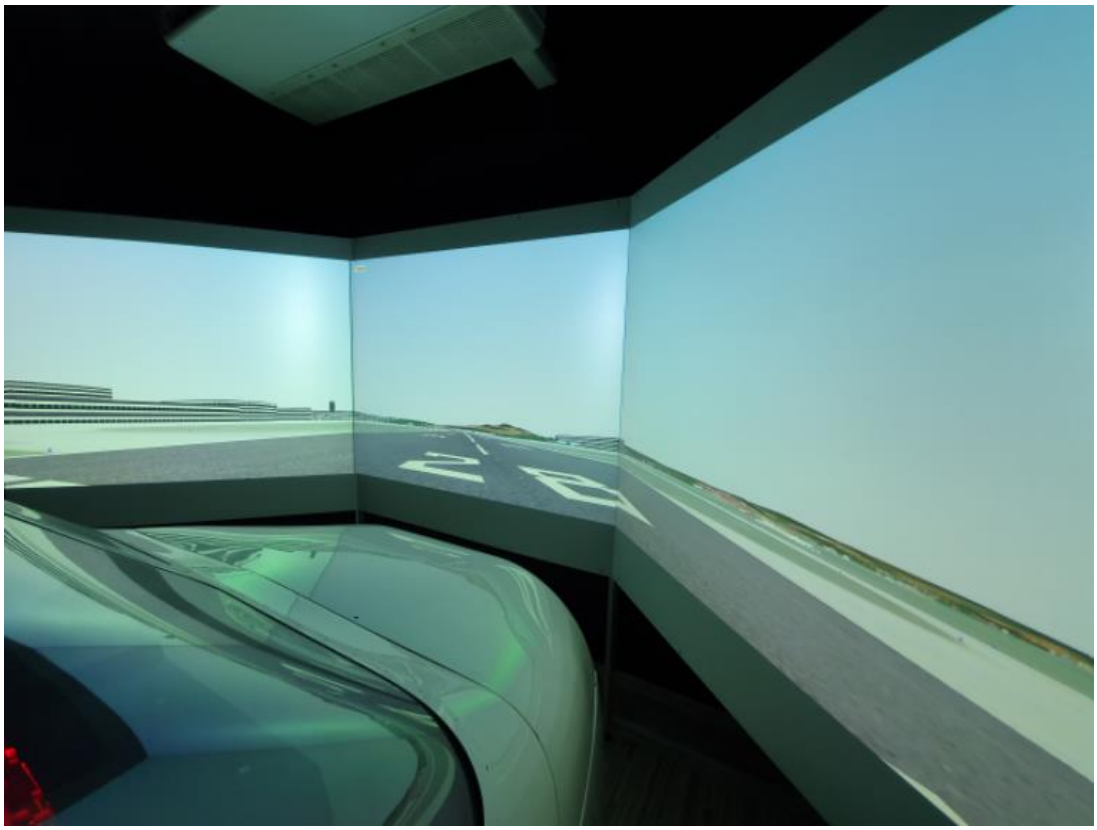
The instrumentation includes a full IFR panel with all engine and fuel gauges, engine/rotor RPM, AH, ALT, ROC, T&B, HSI, VOR, ADF, and Transponder. Engine gauges can be selected as reciprocating or turbine.
The software includes Jeppesen 20,000 airport database, with associated Navaids, and the entire earth's surface with accurate elevation/obstructions.
Software for PHS provides an accurate flight model including translation lift, ground effect, torque, auto rotation for selectable 6 helicopter models: Piston R 22, R 44 (VFR IFR), Schweizer 300 (VFR IFR), Enstrom 280FX, Turbine MD 500, Bell 206 (IFR).

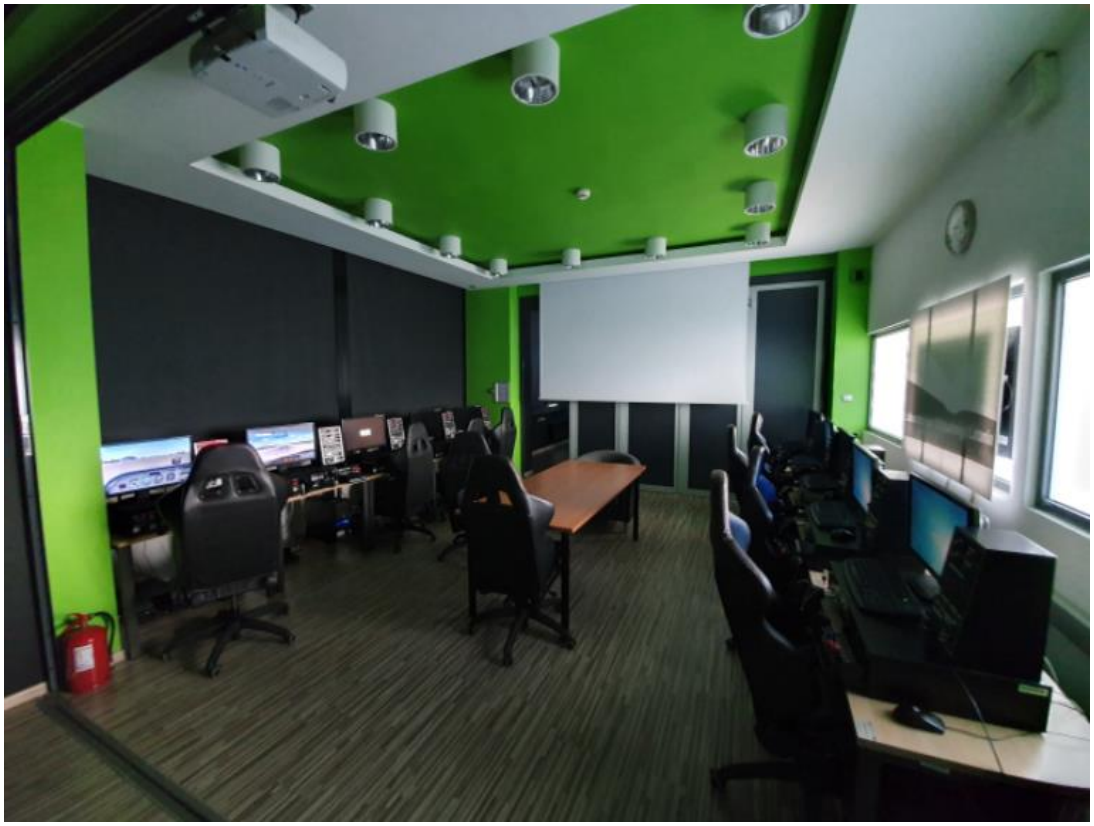
In stationary simulators such airplanes as Cessna 172RG, Piper Seneca III, Piper Arrow IV, and King Air B200 are available.
For all cockpit simulators, professional instructor command centers are supplied. Through the command center, the instructor can select any meteorological weather condition including precipitation, change clouds and wind direction and intensity at multiple elevations, record and replay flights, move a map, make a flight review, or print a flight path.
Additionally, the professional GARMIN GNS430 original simulation devices are installed in stationary cockpit simulators, which, due to vertical navigation function, make it possible to define various approaches, manoeuvres, and procedures based on GNSS.

Below are the photos of the VFL. You can also watch the movie with the VFL presentation

https://www.youtube.com/watch?v=LruMg1JxSrs


ELITE evolution





Example of the application of AR reality in flight simulators

WrightBros background

The research and innovation program of the WrightBroS project is aimed to develop a prototype of a new technology professional flight simulator to demonstrate how the deployment of augmented reality (AR) has the potential to significantly broaden the market for these new products. The economic impact on market expansion will be achieved due to innovations at three layers:

- technological support to “learn as you go” paradigm,
- development of AR-based virtual maintenance and servicing system, and
- new AR-based architecture of the flight simulator (as opposed to current architectures based solely on virtual reality).

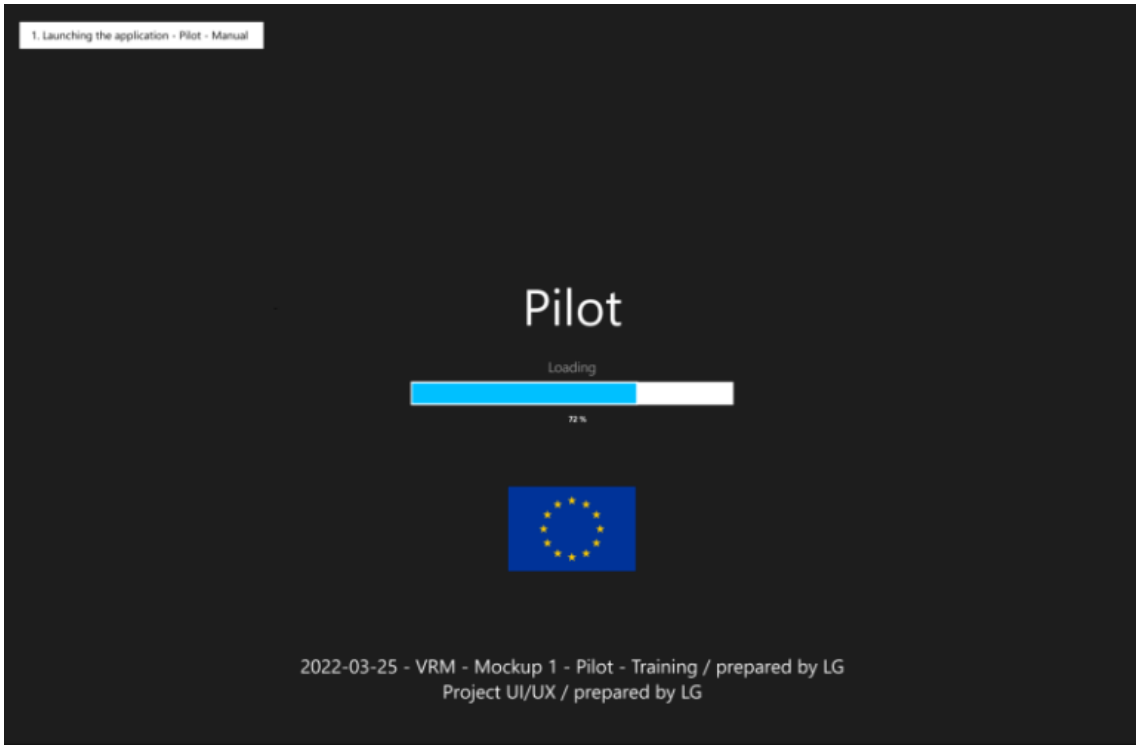
The research leading to these innovations will be performed by collaborative teams from the Silesian University of Technology (PL) and two High Tech companies: LG Nexera (software development company from AT), and VRM (professional flight simulators manufacturer from SK). Such composition not only will mobilize the researchers with complementary skills but also will provide to the WrightBroS project the equipment of exceptional in the Europe Virtual Flight Laboratory at SUT, the resources for complex data management at NXR, and a professional industrial environment for manufacturing flight simulators at VRM.

Working toward the attainment of ambitious scientific goals in this multidisciplinary project will rely on advanced image processing, pattern recognition, procedural knowledge acquisition and
processing, smart diagnostics, augmented reality technology, and aerodynamics simulation models. The envisaged deployment by VRM of the new technology products will increase the competitiveness of the European industry in the world market of professional flight simulators.

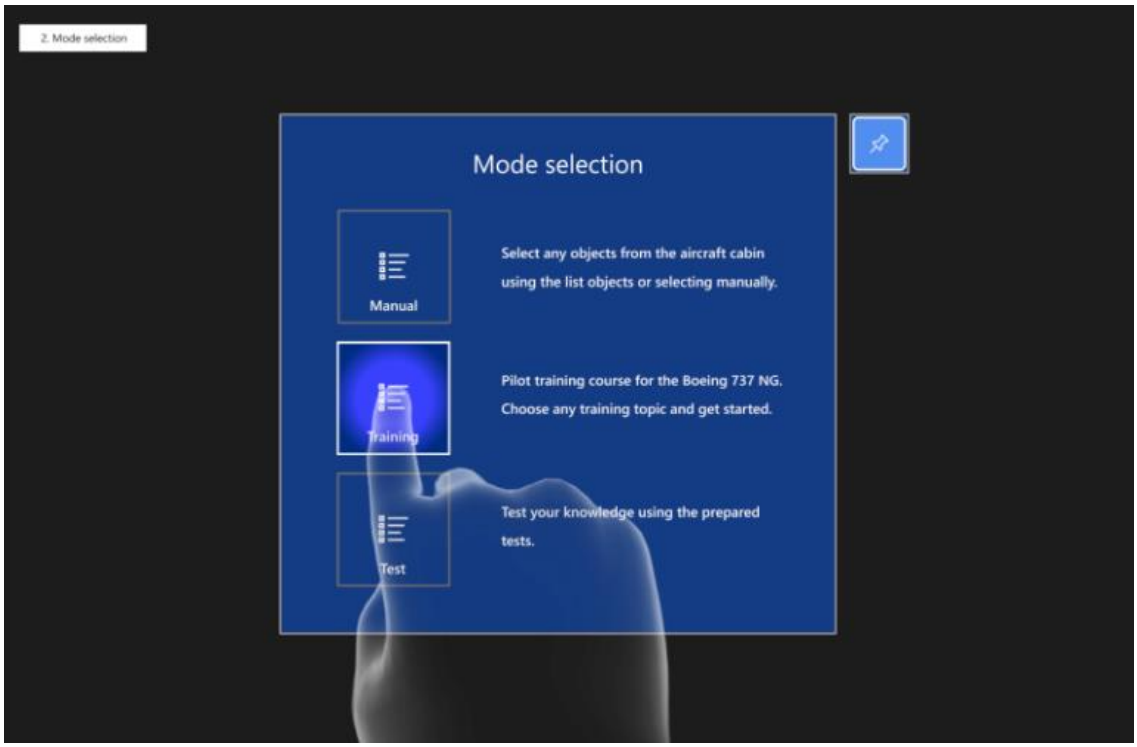
Below is the presentation of the Pilot training process

During the AR base, training phase pilot will put the AR helmet on his search.

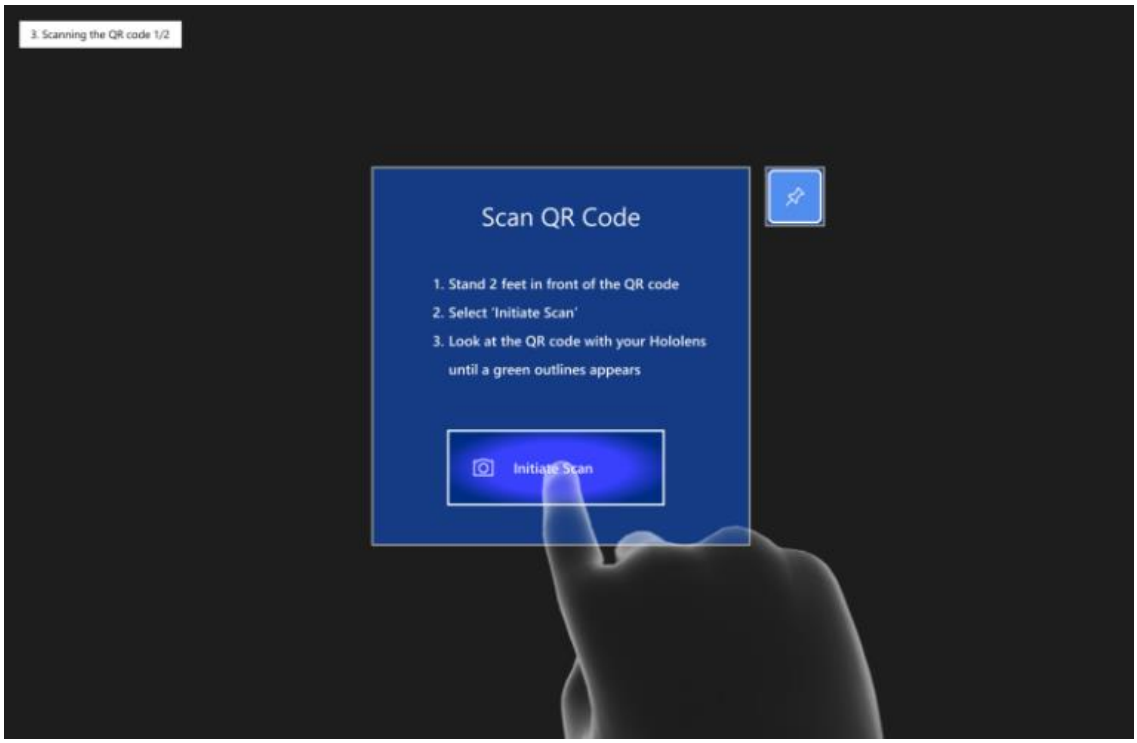
1. There will be a load screen that will inform the trainee that the application is starting as shown below:



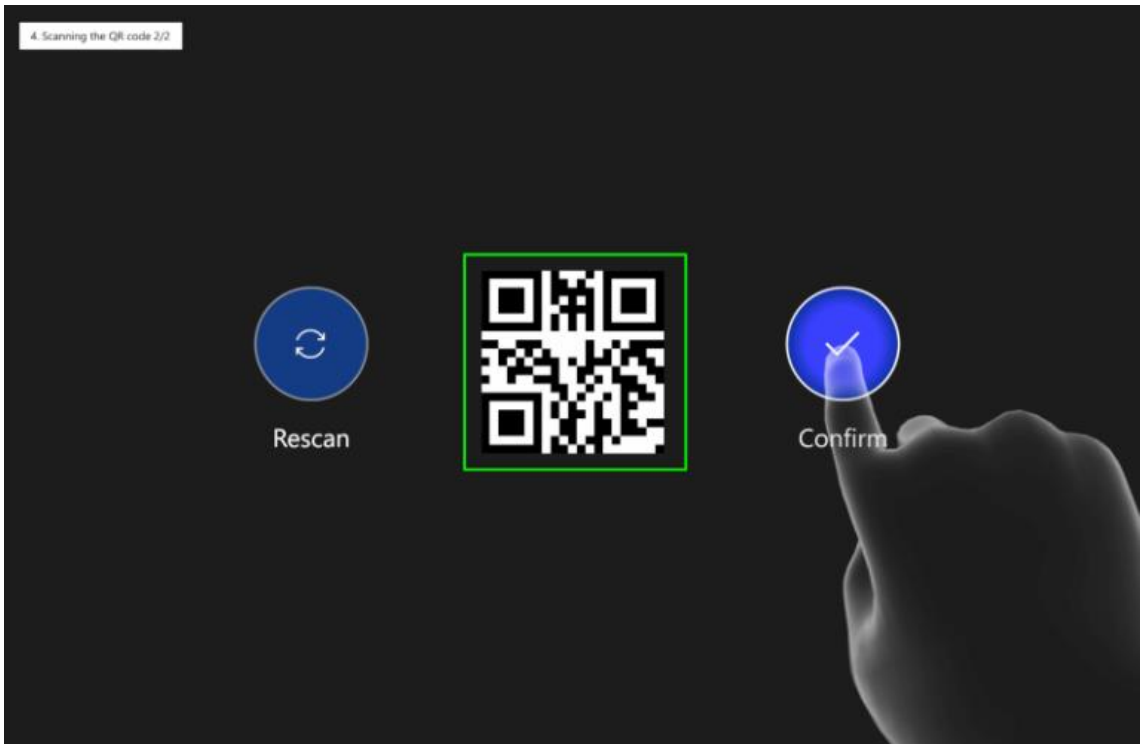
2. The pilot will be able to select the training mode. UI will describe in detail each possible option.



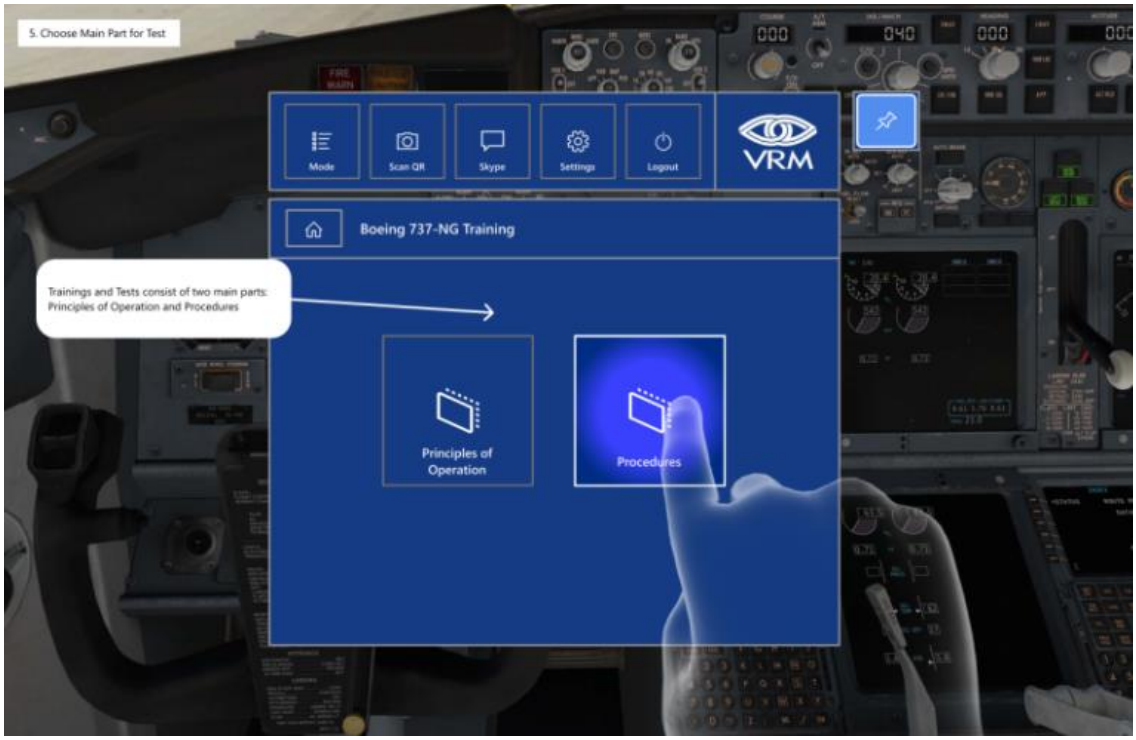
3. In order to synchronize AR with the real-life object application will search for QR codes in the environment.



4 The pilot will be able to confirm that the QR code acquired by the camera of the AR helmet is correct.



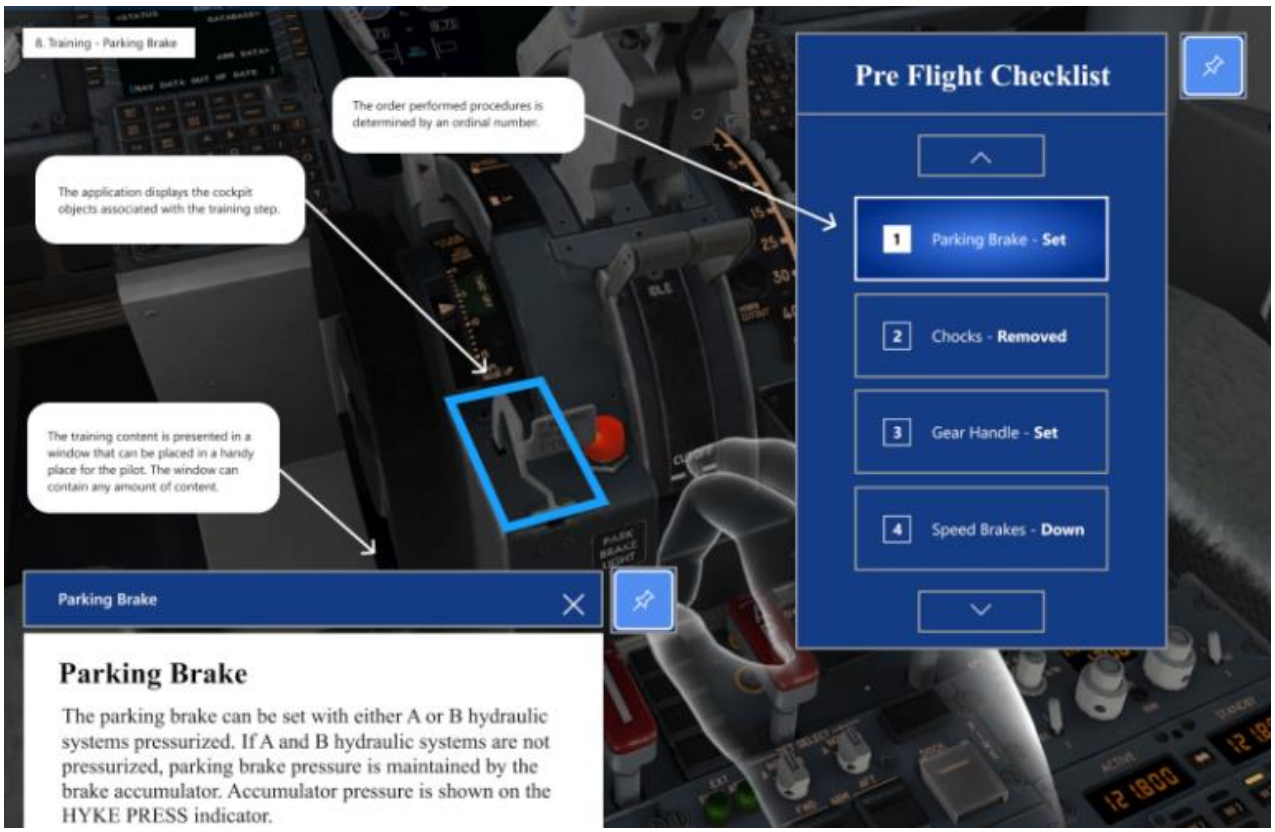
5 Then, a high-level training scenario portfolio will appear.



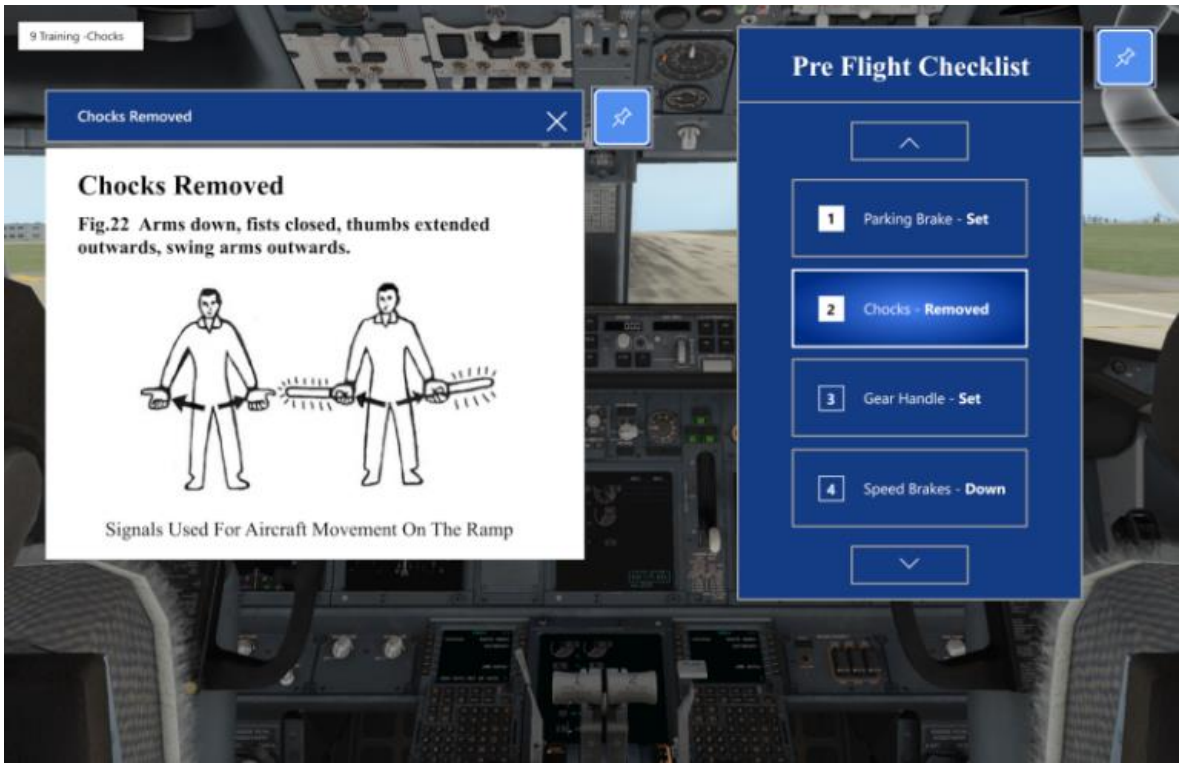
6 In the next step, the trainee will be able to select a specific training scenario.

7 The message with the description of the training scenario will appear.

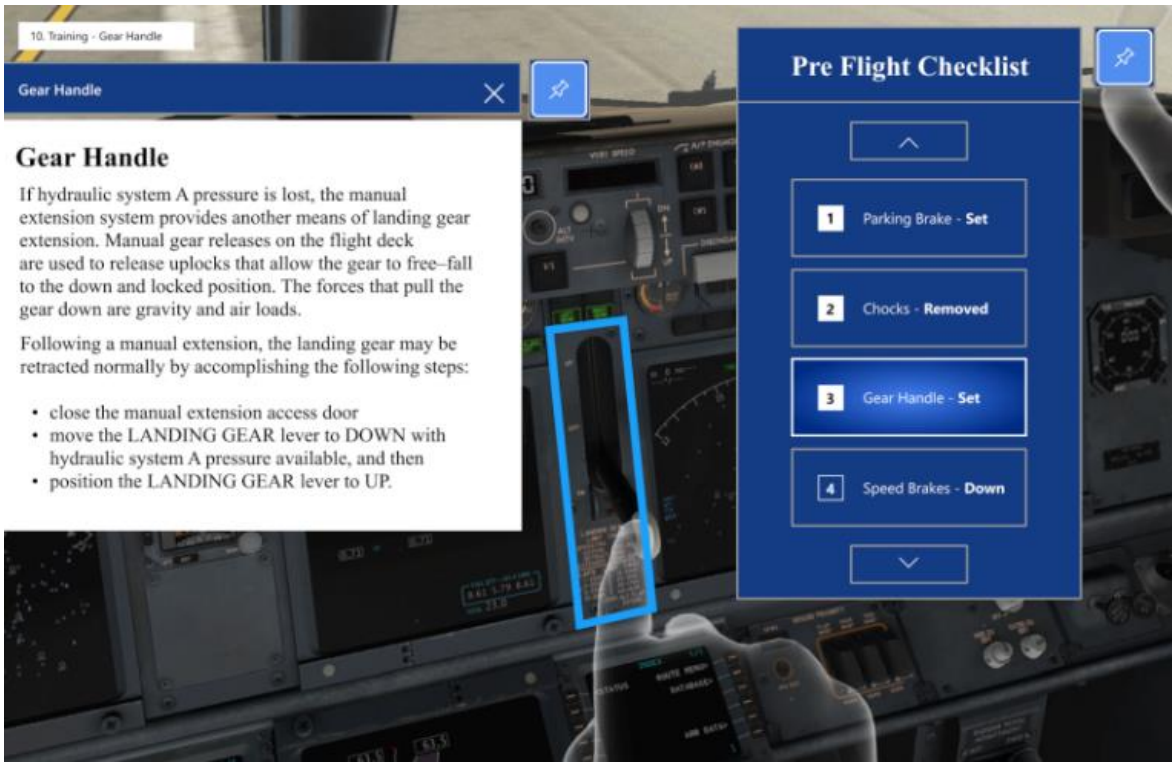
8 Then the pilot will be directed through the steps of the given training scenario. Components of the cockpit will be highlighted according to the needs of the scenario and the clarity of the presentation. In addition, the pilot will be able to see detailed information about the current step as well as the highlight of the scenario realization phase.



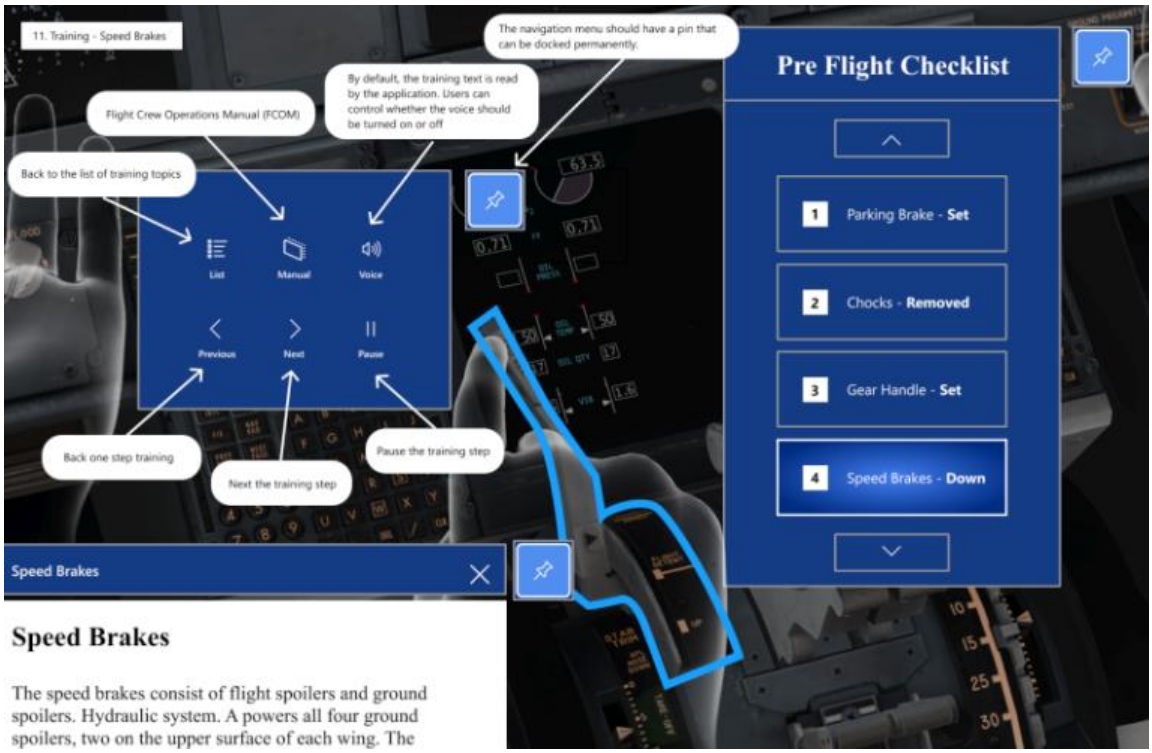
9 Example of the progressing through the scenario. The system will be able to generate voice commands. In addition, the system will be able to understand human speech.



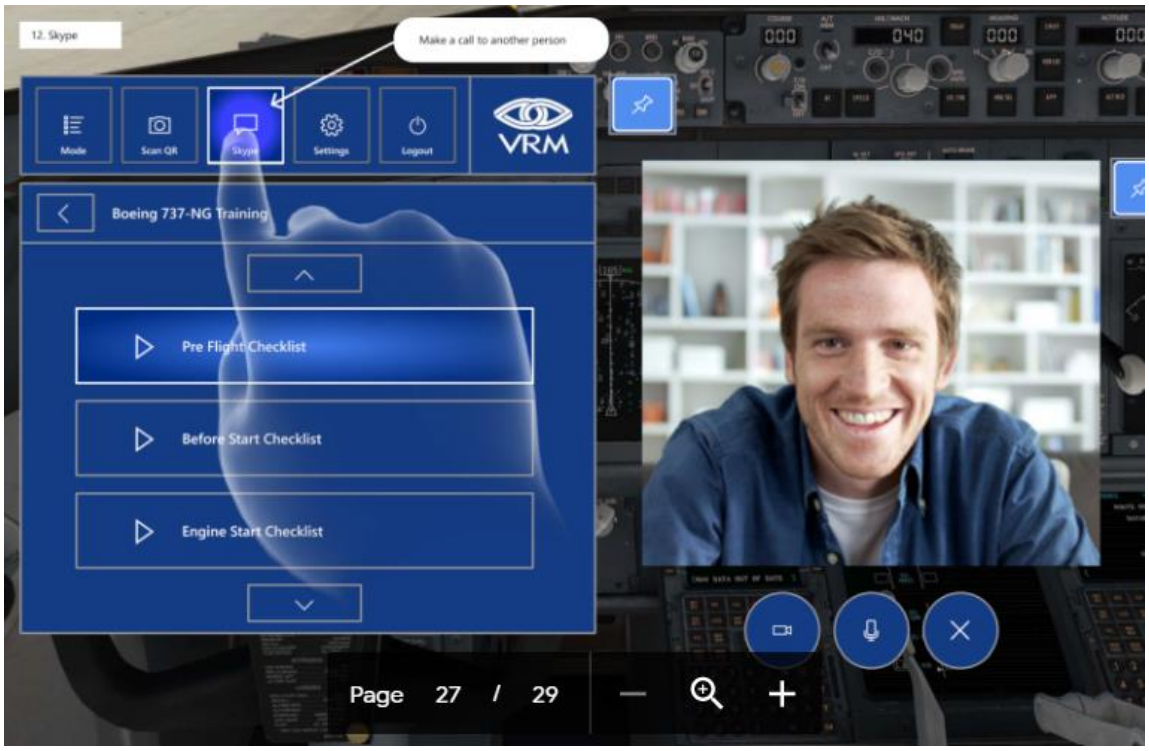
10 Gear handle



11 Speed Brakes



12 The trainee will be able to contact the support (Video + voice call) for specific information and needs.



13 There will possibility to accommodate the system settings (such as speech rate/volume) according to the pilot's needs.

14 During every phase of the training, the pilot will be able to see the plane manual in order to find specific information.