

Vrgineers

Product Portfolio



vrgineers.com

Table of Contents:

About Vrgineers

Since our founding in 2017, we have been on a relentless journey to develop state-of-the-art immersive technologies, specializing in virtual and mixed reality with a particular focus on pilot training.

At Vrgineers, we take immense pride in our diverse product portfolio designed to meet the evolving needs of the aviation industry. Our flagship XTAL headset is engineered to deliver unparalleled visual fidelity with unmatched wide field of view and a seamless training experience. With precision and attention to detail, these headsets immerse pilots in realistic scenarios, allowing them to enhance their skills in a remarkably lifelike environment.

Furthermore, we offer groundbreaking flight simulators scaled to meet various training requirements, catering to cadets, seasoned pilots, and professional military aviators alike. Each simulator is meticulously tailored to different training needs. Aspiring pilots can now engage in lifelike training sessions, learning from various flight scenarios and challenges in a safe and controlled setting.

Our mission is simple yet bold:
to revolutionize the way pilots are trained.

Please take a moment to explore our extensive product portfolio.

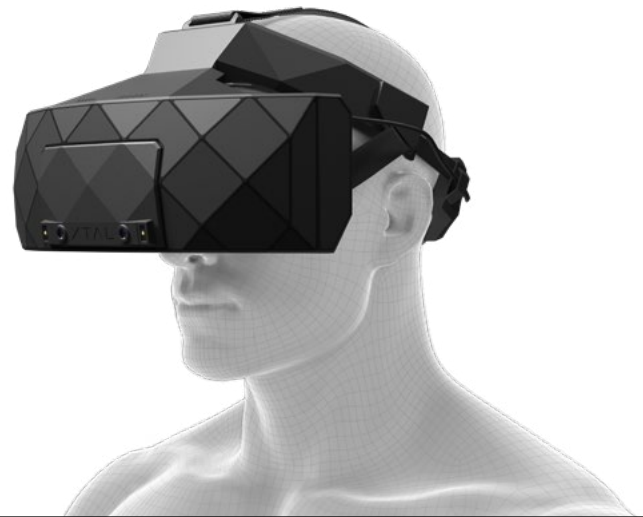
If you have any questions or inquiries, we eagerly await your message. Please find the contact details at the end of this document for your convenience or visit our website www.vrgineers.com for more information.

We look forward to hearing from you!

XTAL 3 Virtual Reality

Pilot Dedicated Headset

The XTAL Virtual Reality headset has been developed and designed for pilot training, with the input of civil and military pilots, to fulfill their professional expectations. The headset ergonomics complies with Naval Air Station Patuxent River pilots' feedback and provides the expected support for full mission training.



Crystal Clear 8K Resolution

Full RGB 4K resolution per eye and patented custom-made non-fresnel VR lenses create realistic simulations with undistorted image across the entire wide field of view.

Vrgineers development team designed advanced optical correction algorithms, which can correct optical flaws such as chromatic aberration or barrel distortion.

Market-Leading Field of View

The natural pilot movement patterns are supported by the widest field of view, up to 180° horizontal and 120° vertical degrees. Thanks to the combination with the highest fidelity, pilots train in 1:1 immersive true-to-life simulation. Avoiding unrealistic simulation reduces negative training significantly.

Customized Corrective Lenses

As the only headset on the market, XTAL offers an unmatched experience for customers with diopters. The XTAL 3 has a simple attachment system for additional prescription lens inserts that replace glasses used for common eye disorders. Vrgineers manufactures customized lenses per the customer's anamnesis in cooperation with the ophthalmologist. Therefore, helicopter pilots, airliners, or instructors can comfortably use the headset during the whole training session.

Integrated Eye Tracking

Eye-tracking technology tracks and gathers the pilot's gaze in real-time. The instructors can use the data for debriefing and behavioral analyses visualized via heatmaps after the session. The instructors and pilots benefit from identifying problems with scanning patterns, increasing their awareness and efficiency in standard procedures.

Customized Solution

The XTAL technology can be modified hardware-, firmware-, and software-wise to fit specific use cases perfectly. Vrgineers specializes in advanced training technologies using virtual and mixed reality, including building flight simulators, and has experience with XTAL integration into the pilot helmet. Additional sensors or specific chips can extend the technology while keeping high-security standards.

Unique Hand Tracking

Embedding the most advanced infrared hand tracking module from Ultraleap enables pilots to interact with the virtual cockpit by simply pointing their fingers against flight controls.

Tracking system

The default configuration of XTAL headset comes with SteamVR tracking sensors. However, it can be upgraded with additional tracking technology. The customer can choose from a variety of supported tracking systems fitting the specific use case.



XTAL 3

- + Wide field of view
- + High resolution
- + Professional training

Consumer VR Headset

- Limited field of view
- Low resolution
- Gaming industry

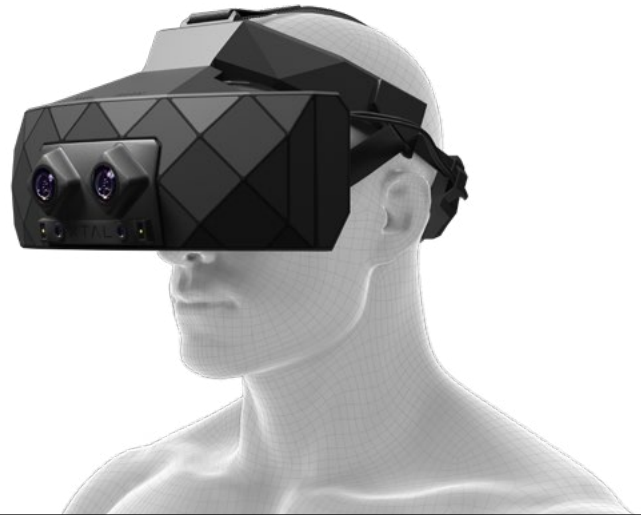
Technical Specifications

RESOLUTION	3840 x 2160 per eye
DISPLAYS	Two fast-switching 4K LCD displays for virtual reality
REFRESH RATE	75 Hz @ 4K per eye, 120 Hz @ QHD per eye
FIELD OF VIEW	180° horizontal, 120° vertical (maximum experimental values) 140° horizontal, 90° vertical (default values)
ADVANCED FEATURES	Foveated Rendering, Timewarp
EYE TRACKING	Gaze analyses, heatmap visualization, running native 120 Hz (up to 210 Hz)
POSITIONAL TRACKING	Lighthouse (SteamVR)/ART/Optitrack/Polhemus/Vicon or custom
HAND TRACKING	embedded Ultraleap sensor
IPD	Auto IPD - range 56-74 mm
HEADSET CONNECTIVITY	VirtualLink (5 m / 16.40 ft) cable or DisplayPort 1.4 , USB 3.2 gen 2, Power 12V, 3A (5m / 16.40 ft)
OS	Microsoft Windows
SOFTWARE SUPPORT	Steam VR and OpenXR drivers Unity, Unreal and other game engines plugins C++ libraries (DirectX, OpenGL, Vulkan)
SIMULATORS SUPPORT	Commercial: Prepar3D, DCS World, X-Plane 11/12, Microsoft Flight Simulator, Aerofly FS, FlyInside Professional: Prepar3D, MCS, X-Plane 11/12, Bohemia Interactive Simulations (VBS3, VBS4, Blue IG), MAK, Simigon, multiSim, Metrea
WEIGHT (without headstrap)	600 g / 21 oz
DIMENSIONS (headset only)	293 x 123 x 113 mm / 11.53 x 4.84 x 4.44 in

XTAL 3 Mixed Reality

Pilot Dedicated Headset

Representing the state-of-the-art technology used in next-generation training, the XTAL 3 Mixed Reality headset was developed to meet the high requirements of professional pilots.



Besides the common attributes of the XTAL 3 Virtual Reality headset, it has the embedded mixed reality module. MR technology has the potential to revolutionize pilot training by providing a highly immersive and interactive learning experience that can improve safety, reduce costs, and enhance the effectiveness of training programs.

Customized Camera Lenses

Considering the different types of training, XTAL offers various mixed-reality lenses to cover the full spectrum of use cases. Special lens types and resolutions can be custom designed to fit any program requirement, from high fidelity with 60PPD and limited peripheral vision to a full field of view coverage with lower fidelity.

Market-Leading Field of View

The natural pilot movement patterns are supported by the widest field of view, up to 180° horizontal and 120° vertical degrees. Thanks to the combination with the highest fidelity, pilots train in 1:1 immersive true-to-life simulation. Avoiding unrealistic simulator scenarios reduces negative training significantly.

Integrated Eye Tracking

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Tracking System

The default configuration of XTAL headset comes with SteamVR tracking sensors. However, it can be upgraded with additional tracking technology. The customer can choose from a variety of supported tracking systems fitting the specific use case.

Advanced Masking

With advanced masking using the combination of green screen function and 3D object mapping, any environment and airplane cockpit can be easily masked and used for mixed reality simulation.



Fidelity

The Fidelity level and combination of front-facing cameras and matching 4k resolution screens enable pilots to read the instrument panels and MFDs.

Customized Corrective Lenses

As the only headset on the market, XTAL offers an unmatched experience for customers with diopters. The XTAL 3 has a simple attachment system for additional prescription lens inserts that replace glasses used for common eye disorders.

Hand Tracking

Combined with the Ultraleap infrared hand tracking and proprietary RGB passthrough cut-out, hands constantly stay visible and perfectly tracked, even in front of the virtual cockpit. Pilots can see their own hands without any additional sensors required.

Crystal Clear

Full RGB 4K resolution per eye and patented custom-made non-fresnel VR lenses create realistic simulations with undistorted images across the entire wide field of view.

Vrgineers development team designed advanced optical correction algorithms, which can correct optical flaws such as chromatic aberration or barrel distortion.

Head Tracking Compensation

Head Tracking Compensation optimized for mixed reality cockpits minimizes drift between virtual and camera images and improves the overall immersion.

Technical Specifications

VIRTUAL REALITY RESOLUTION	3840×2160 per eye		
VIRTUAL REALITY REFRESH RATE	75 Hz @ 4K per eye, 120 Hz @ QHD per eye		
FIELD OF VIEW	180° horizontal, 120° vertical (maximum experimental values) 140° horizontal, 90° vertical (default values)		
MIXED REALITY RESOLUTION & REFRESH RATE	Foveated profiles: up to 3840 x 2192 @90Hz		
UNCOMPRESSED PROFILES:	3864 x 2192 @45Hz, 2232 x 2192 @75Hz		
MIXED REALITY FIELD OF VIEW *	Horizontal FOV	Vertical FOV	Pixel per degree
HIGH FIDELITY LENS	63 °	38 °	60
BALANCE LENS	106 °	58 °	45
IMMERSIVE LENS	148 °	84 °	30
INFINITE LENS	175 °	100 °	22
<i>*The values may differ depending on the software settings and hardware version and used measurement method.</i>			
DISPLAYS	Two fast-switching 4K LCD displays for mixed reality		
EYE TRACKING	Gaze analyses, heat map visualization, running native 120 Hz (up to 210 Hz)		
POSITIONAL TRACKING	Lighthouse (SteamVR)/ART/Optitrack/Polhemus/Vicon or custom		
HAND TRACKING	embedded Ultraleap sensor		
IPD	Auto IPD range 56-74 mm		
HEADSET CONNECTIVITY	VirtualLink (5 m/16.4 ft) cable or DisplayPort 1.4 , USB 3.2 gen2, Power 12V, 3A (5 m/16.4 ft)		
OS	Microsoft Windows		
SOFTWARE SUPPORT	Steam VR and OpenXR drivers, Unity, Unreal, and other game engine plugins, C++ libraries (DirectX, OpenGL, Vulkan)		
SIMULATORS SUPPORT	Commercial: Prepar3D, DCS World, X-Plane 11/12, Microsoft Flight Simulator, Aerofly FS, FlyInside Professional: Prepar3D, MCS, X-Plane 11/12, Bohemia Interactive Simulations (VBS3, VBS4, Blue IG), MAK, Simigon, multiSim, Metrea		
WEIGHT (without head strap)	700 g / 24.69 oz		
DIMENSIONS (headset only)	293 x 123 x 113 mm / 11.53 x 4.84 x 4.44 in		

Portable Trainer

A complete package with a small footprint.

The Vrgineers Portable Trainer offers unlimited training with unlimited aircraft types and scenarios. Thanks to its design, it is a perfect solution for tactical mission training, with a wide field of application reflecting the civil or military flight training needs. Flying in the Trainer increases first-time pass rates, reduces additional re-flights, eliminates negative training, and cuts traditional training costs. Due to the higher risks involved in specific roles i.e. rescue missions, squadron flight, the simulator is an excellent tool that enhances safe training without exposure to the risks involved in these operations. This applies to both initial and recurrent crew training.



Enhanced & Multi-Crew Training

The Portable Trainer is a versatile and effective tool designed for mission and procedural training for pilots of all skill levels. Whether you are a cadet looking to improve your procedural knowledge and skills or an experienced pilot aiming to train to proficiency in multicrew coordination or group flying, the Portable Trainer can help you achieve your goals. Furthermore, pilots can practice collective training regardless their physical location as all the Vrgineers Trainers can be interconnected.

Fixed & Rotary Wing Platforms

The overall convenience of the usage is given by the easy plug and play design and reconfiguration from a fixed wing to a rotary wing within minutes. The set up includes premanufactured controllers for different types of aircrafts with a smart and smooth fastener system. The reinforced hard case with handgrips and wheels allows transport of the simulator by a single person.

COTS Upgradeable Components

Using the commercial off-the-shelf components makes the Portable Trainer affordable and easy to upgrade and maintain. The interchangeable key components extend the product lifecycle. The adjustable seat can be upgraded with a vibration pad for securing realistic reactions e.g. during rolling, take-offs, taxiing, stall effects, rumbling, flat movement, or extending landing gear. Different types of controllers can be used according to preferences as well.

XTAL Ultimate Immersion

The Portable Trainer complemented by the XTAL 3 Virtual Reality headset represents the best combination providing the highest level of realistic simulation. The XTAL was developed especially for professional pilots so that the pilots' eye movement patterns are supported with the widest field of view on the market, full RGB 8K resolution paired with patented custom-made non-fresnel VR lenses, realistic view with undistorted images and integrated eye tracking.



Technical Specifications

THE MOST POPULAR AIRCRAFT MODELS

Fixed-wing fighters: F-15 Eagle, F-16 Fighting Falcon, F-18 Hornet, F-22 Raptor, F-35 Lightning II
Fixed-wing trainers: T-6 Texan, T-45 Goshawk, Pilatus (PC-7, PC-9, PC-12), DART Series, Grob G 120TP, Aero L-39 Albatros
Rotary-wing - combat helicopters: UH-60 Black Hawk, AH-64 Apache, AH-1Z Viper, UH-1Y Venom, MD 530F
Rotary-wing trainers: Robinson (R22, R44), Bell (206, 412), Eurocopter EC 135, AugustaWestland AW139

SOFTWARE SUPPORT

Commercial: Prepar3D, DCS World, X-Plane 11/12, Microsoft Flight Simulator, Aerofly FS, FlyInside
Professional: Prepar3D, MCS, X-Plane 11/12, Bohemia Interactive Simulations (VBS3, VBS4, Blue IG), MAK, Simigon, multiSim, Metrea

PACKAGE

XTAL 3 Virtual Reality Headset
Virtual Reality tracking system
XTAL certified computer with simulation engine (IG)
HOTAS (Throttle, Stick, Rudder)
Adjustable seat with leg rest
Speakers for acoustic feedback
Computer accessories: Keyboard, trackball, USB Hub, power cables
Power consumption: 250W

UPGRADES & CUSTOMIZATION

Variety of different controllers
Vibration pad
Additional screens
Different types of headsets

TECHNICAL SPECIFICATIONS

Hard case: IP67 Waterproof - Dustproof
Size (closed): L x W x D: 1178 x 718 x 427 mm / 3.9 x 2.3 x 1.5 ft
Size (installed): 1178 x 718 x 1080 mm / 3.9 x 2.3 x 3.6 ft
Footprint: 1.03 m² / 11 ft²
Weight: 80 kg / 176 lbs.

Classroom Trainer

Upscale the pilot training.

Meeting the high requirements for next-generation pilot training, the Vrgineers Classroom Trainer represents a high-end, affordable solution. Modularity and efficiency are the essences of the concept. The product consists of exchangeable modules - the instrumental panel and side panels, allowing to change the of aircraft type. Therefore, the customer can have more training platforms and extend the training options for fewer costs.

Training sessions in the Classroom Trainer increase first-time pass rates, reduce additional re-flights, minimize negative training, and cut traditional training costs.



Platform Reconfigurability

The key factor in transitioning from traditional to modern pilot training is the availability of high-quality simulators to pilots. Vrgineers invented Classroom Trainer to help to make the training accessible and affordable. The Vrgineers Classroom Trainer is a versatile training tool that allows a seamless transition from a piston engine-powered propeller aircraft to a supersonic fighter aircraft, allowing students to develop their skills from novice to expert in a single device.



Motion Platform

Flying in the Classroom Trainer with a motion platform reduces the risk of the negative impact of simulator sickness during the training. The unit responds to the user's actions in realistic ways, such as landing or simulation of engine failure. The movements elicit the same reactions and emotions as in a live situation, which are supported by realistic visualization.

Virtual or Mixed Reality Trainer

Vrgineers is able to manufacture any virtual or mixed reality trainer regardless of the aircraft type - fixed or rotary wing, single or two-seat, jet fighter, or airliner. Considering the customer's needs, the Classroom Trainer comes in a virtual or mixed-reality version. Since the virtual Trainer is equipped with the HOTAS, it serves more tactical or mission training purposes. The functional replica of the side and central panels in the mixed reality option upscales the training since pilots can train standard and emergency procedures.



Cost and Time Efficiency

The Trainer is made from commercial off-the-shelf components (COTS), making it affordable and easy to maintain. The lifecycle of the simulator can be extended as key components are easily interchangeable while providing the highest level of immersive simulation. The design of the solution allows operating the Trainer by the pilot without the help of a technician.

Debriefing and Analytics

The debriefing module, as a part of the Classroom Trainer features, records the flight data of all the users for further analysis after the training. The data can be replayed in a 3D situation map and analyzed with built-in eye tracking.

XTAL 3 Mixed Reality

The Mixed Reality XTAL 3 headset achieves high fidelity, which enables pilots to train in a completely immersive environment. The video passthrough cameras allow pilots to see their hands, naturally move in the cockpit, and interact with instruments without any limits.

Unlimited Collective Training

The Classroom Trainer is designed to support unlimited numbers of connected pilots within a synthetic training environment. Develop and practice tactics and communication between units in combined missions at different locations across the globe. Take full advantage of joined training sessions between the land, air, naval, and ambient forces, and prepare troops to sharpen skills in mission execution, formation flight, maneuvering, or pilot/co-pilot communication with ATC.

Technical Specifications

THE MOST POPULAR CONFIGURATION	Fixed-wing fighters: F-15 Eagle, F-16 Fighting Falcon, F-18 Hornet, F-22 Raptor, F-35 Lightning II Fixed-wing trainers: T-6 Texan, T-45 Goshawk, Pilatus (PC-7, PC-9, PC-12), DART Series, Grob G 120TP, Aero L-39 Albatros Rotary-wing - combat helicopters: UH-60 Black Hawk, AH-64 Apache, AH-1Z Viper, UH-1Y Venom, MD 530F Rotary-wing trainers: Robinson (R22, R44), Bell (206, 412), Eurocopter EC 135, AugustaWestland AW139
SIMULATION SUPPORT	Commercial: Prepar3D, DCS World, X-Plane 11/12, Microsoft Flight Simulator, Aerofly FS, FlyInside Professional: Prepar3D, MCS, X-Plane 11/12, Bohemia Interactive Simulations (VBS3, VBS4, Blue IG), MAK, Simigon, multiSim, Metrea
PACKAGE CONTENT	XTAL 3 Virtual or Mixed Reality Headset Virtual Reality tracking system XTAL certified computer with simulation engine (IG) HOTAS (Throttle, Stick) Spring loaded or CLS (Control Loading System) primary flight controls (stick/cyclic and rudder pedals) Adjustable seat Speakers for acoustic feedback Computer accessories: IOS (Instructor Operations Station) Power consumption: 2000W
RECONFIGURABILITY	Fixed-wing, Rotary-wing, Land vehicle
UPGRADES & CUSTOMIZATION	Variety of different controllers Vibration pad 4-DOF motion system Additional screens Different types of headsets
TECHNICAL SPECIFICATIONS	Load capacity: 200 kg / 440 lbs. Dimensions L x W x H: approx. (config driven) 2240 x 1400 x 1457 mm (7.35' x 4.6' x 4.8') Weight: 250 kg / 551 lbs.