IMMERSIVE TECHNOLOGIES IN AEROSPACE TRAINING – Technology Overview Extract

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XR Technologies Primer

From UP360

Extended reality (XR) is an all-encompassing term referring to a collection of immersive technologies including Virtual Reality, Augmented Reality and Mixed Reality. As of today, there is no universally accepted definition of XR technology and what is or is not included in XR. Ask three different people and you will get three slightly different answers. The definitions and categories presented here and in more detail in Chapter 5 are intended to make it easy to understand each form of XR within the context of education and training in the aerospace industry.

THREE MAIN FORMS OF XR

Virtual Reality

Put a headset on, pick up controllers and immerse yourself in a digital world or training simulation of your choosing. With VR, you're completely closed off from the real world around you.

Augmented Reality

One of the scalable, but least immersive forms of XR. Using a smartphone or tablet with a camera, you can see and interact with digital objects in the real world through the window that is your screen.

Mixed Reality

A true blend between the real and digital world. Through a pair of glasses that understand your physcial space, you can see and iteract with digital objects that apear within the real world around you.

1. Virtual Reality

Virtual Reality (VR) is a technology used to fully immerse an individual into computer generated worlds or experiences. The real world temporarily ceases to exist while participants look around, move around and often times even interact with the digital reality that VR enables.

Although there are many different forms of VR, each requires two main components. The Head Mounted Display (HMD) and a computer-generated experience. These experiences can be fully animated with 3D objects and worlds created from scratch or they can be created by stitching together real-world photos and videos captured with a specialized camera.

VR headsets can range in both cost as well as immersion. The higher end equipment, though more expensive, can enable significantly more immersive and realistic experiences. All VR can be broken into two classifications Three Degrees of Freedom (3DOF) and Six Degrees of Freedom (6DOF). 3DOF VR allows users to look up, down and side to side, but doesn't allow any forward or backwards movement. These experiences are typically the end result of content captured with a specialized 360 degree VR camera. 6DOF VR allows for the tracking of translational motion as well as rotational motion, giving the user more freedom and an ability to perform real life tasks.

2. Augmented Reality

Augmented Reality (AR) is a technology used to overlay computer-generated objects or animations in the real world. The technology works by utilizing the camera and display of a smartphone or tablet. The camera captures a real-time recording of the world behind it, while the display superimposes a digital object on top. Traditional AR experiences require some type of physical marker for the digital object to stick to. As the user moves a device around, the object stays fixed to the tracker, creating the sense that the object is really there.

More modern AR experiences can now incorporate things like physics, audio and other forms of haptics to make the experience realistic. It's important to note that, unlike Virtual Reality which is designed to immerse the user into completely new worlds, Augmented Reality is designed to change the real world around them. The biggest limitation of AR is the need to hold a device in your hand and look through a screen to see the experience.

3. Mixed Reality

Mixed Reality (MR) is the newest and most unique technology in the XR family. It can be thought of as a hybrid between VR and AR, although some people prefer to call it another form of AR. Like VR, MR requires the user to wear a specialized set of goggles and like AR, MR glasses still allow the user to see the world around them. With Mixed Reality, the real and digital worlds blend seamlessly together as interfaces are projected through the glasses. Since the device is worn on the user's head, one can simply use hand gestures to interact with the content and navigate digital screens. MR is often referred to as hands-free computing since the device is more powerful than the average laptop which allows a user to perform almost any task a computer could.

Next Steps: A Roadmap for XR in Aerospace Training

From UP360

WHY XR?

Reasons why companies are investing in XR differ. XR has the potential to alter the way we communicate, work and train. However, it is important to understand the pros and cons of the technologies and what to consider when looking at investing in these new tools.

THE WAY WE COMMUNICATE

Limiting video conferencing calls; with XR, a headset is all you need to be in the same room as your friends and co-workers.

THE WAY WE WORK

Visualize data in new ways; accessing information anytime, anywhere without tying up your hands.

THE WAY WE LEARN

The potential for advanced training, including more realistic simulations of sophisticated and precise training tasks and activities.

VIRTUAL REALITY

The most common forms of virtual reality are...

360° Photo & Video or 3DOF VR

3DOF VR is a limited and low-level form of VR that requires inexpensive hardware to run. 3DOF VR is typically captured using a specialized VR camera designed for panoramic photo or video. The video can be viewed in VR or run on a phone or tablet outside of VR as a panoramic image. The most recognizable form of this is what you see on google street view; just imagine instead of using your mouse to look around you use your head while wearing a VR headset. Most 3DOF-only VR headsets are being phased out as stand-alone headsets become cheaper and more powerful.

Stand Alone VR - 6DOF

Stand-alone VR allows you to view 3DOF content along with more immersive and interactive 6DOF content. These headsets do not require an external computer to render the graphics; instead, they have an onboard GPU similar to a high-end smartphone. This type of VR is often limited in terms of how realistic you can make an experience because of the limited processing power. However, its most significant benefit is lower cost and portability compared to PC VR. Some examples of Stand Alone 6DOF VR headsets include Oculus Quest and the Pico Neo 3.

PC Based VR - 6DOF

PC VR offers the most powerful and immersive experiences you can get. These experiences leverage a headset tethered to a high-powered gaming PC or laptop to render the VR experience. These VR experiences can oftentimes look realistic and push the boundaries of what is possible in the virtual world. The pitfalls of PC VR are in its higher cost and lack of portability due to the external PC required to power it. Some examples of PC-Based VR headsets include Vive Pro 2 and Valve Index.

Our criteria for evaluating each technology

IMMERSIVENESS & QUALITY

On a scale of 1-5, 1 represents traditional learning techniques such as watching a video, looking at a photo or reading (very passive activities), whereas 5 represents learning by doing the real thing, one of the most hands-on and engaging ways to learn.

USABILITY & SCALABILITY

On a scale of 1-5, 1 represents technology that is not user-friendly and would require someone with a significant technical aptitude to operate like a 3D printer, while 5 represents technology that is easy to use and is ready to be deployed to the masses, like a smart phone.

COST & TIME OF RUNNING A PILOT

A general range for cost (in CDN) and time associated with developing and deploying a pilot with each technology. We will also make a note of any off-the-shelf software and its associated costs.

360° Photo & Video or 3DOF VR

How's it made?

3DOF VR is typically created using a specialized VR camera designed to capture panoramic photos or videos. These cameras leverage multiple lenses to shoot with no blind spots. The image is then stitched together in a way so it appears seamless when viewed in VR. Low-cost cameras that are point and shoot cost around $500, but will yield poor image quality that can be unwatchable in VR. Higher-end units can cost tens of thousands of dollars and are significantly more complex, often requiring a skilled operator and editor to work with the content.

The Pros

Straightforward use.

The hardware is affordable.

Scalability; the technology works on other types of devices with little effort needed to port it over.

The Cons

It may cause motion sickness.

Files can be very large, especially with higher-quality video.

Image quality is often grained and pixelated through a VR headset.

Here is how we rate the technology....

IMMERSIVENESS & QUALITY

2 OF 5

Low Immersiveness & Low Quality

This type of VR has little interactivity. It's point-and-click interactions with the ability to look around. Additionally the images are also low quality, with most content lacking depth perception which causes photo and video distortion when seen in VR.

USABILITY & SCALABILITY

4 OF 5

Ease of Use and Scalability

What it lacks in quality and immersivness, it makes up for in scalability and user-friendliness. Put the headset on and press play, and you are ready to go. It's also easy to mass deploy devices or send content to people to view with smartphones at home.

COST & TIME OF RUNNING A PILOT

LESS THAN $25K

Low Cost and Quick to Produce

This type of VR is still popular today in part because of its comparatively low cost. All you need is a VR camera, basic video and photo editing skills and off-the-shelf editing software, and you can produce and publish content.

Stand Alone VR - 6DOF VR

This type of VR is very similar to PC-Based VR. The only significant difference is in the hardware. Stand Alone VR headsets have an onboard GPU that's nearly as powerful as those found in high-end smartphones. This renders experiences with just the headset and controllers. Both types of hardware allow users to view 6DOF or 3DOF content.

The Pros

The hardware is significantly more affordable compared to PC VR. +/- $1000 per unit.

Without the need for a PC, the hardware is portable and can more easily be taken home by learners.

The Cons

There are significant limitations in the processing power of the headset. Experiences will be limited in fidelity and realism.

By default, the experience in the headset is not cast to an external display. This makes it hard for other participants or instructors to see what the learner is seeing.

Here is how we rate the technology....

IMMERSIVENESS & QUALITY

Highly Immersive & High Quality

This type of VR offers highly immersive 6DOF VR experiences and has improved quality when compared to 3DOF headsets. Compared to PC VR, however, the quality is significantly less due to the small onboard GPU that may create challenges with optimization.

USABILITY & SCALABILITY

Ease of Use and Scalability

A headset and controllers is all you need—making this one of the most scalable and easiest to use forms of XR on the market today. Take it home in a backpack or ship it to an employee in a small box.

COST & TIME OF RUNNING A PILOT

It can be costly to custom develop

Because of how this type of VR is created, along with potential optimization challenges, it can be costly to develop even a simple pilot for education and training.

PC Based VR - 6DOF VR

With PC VR, you can get the most lifelike VR experience currently available. These headsets use a PC with a more powerful GPU than the built-in smaller GPUs in standalone VR to render the experience. This enables high fidelity and lifelike simulations. Both types of 6DOF VR are typically created from the ground up using game programing software like Unity or Unreal Engine.

The Pros

You get the highest quality, most realistic VR experience possible.

Other participants and teachers can see what you see on the PC screen. This makes it easy for teachers to help and allows students to learn by watching.

The Cons

The hardware is more expensive due to the need for a PC. +/- $5000 per unit.

The setup is also less portable due to the need for a PC.

Here is how we rate the technology....

IMMERSIVENESS & QUALITY

Highly Immersive & High Quality

PC VR is the most realistic VR experience currently available. This variety of VR provides rich, immersive interaction and high-quality graphics that is unmatched in other current VR or XR forms.

USABILITY & SCALABILITY

Ease of Use and Scalability

This setup requires a PC or gaming laptop to run the simulation. It's easy to use while it's also easy to view what learners are experiencing. Plus it can still be portable if paired with a laptop.

COST & TIME OF RUNNING A PILOT

It can be costly to custom develop

Because of how this type of VR is created along with the optimization challenges, it can be costly to develop even a simple pilot for education and training. Costs of hardware may also be a barrier for smaller organizations.

A Real Life Case Study

The International Air Transport Association (IATA) faced a challenge of how to train employees effectively if they are unable to learn on-site by experiencing work in real-life situations. IATA needed to establish a training program to provide trainees with extensive classroom-based learning, mixed with shadowing experienced staff. While this gave trainees a thorough theoretical grounding, it did not give them a real sense of the work space, including the impacts of adrenaline, fear, their reactions and decision-making skills. Dimitrios Sansos, Senior Product Manager of Airport, Fuel & Ground Operations Training and Publications, expressed his concerns and identified VR as a solution:

"The most effective way to learn is through experience. In live operations, it's very difficult to show people what can go wrong and how you can mitigate. Everything is smooth when operations are running in a very safe way. You don't have the chance to show them what can go wrong... In the virtual environment, you can replicate error issues that we know exist in the industry and you can do it several times without affecting any real operations or any real equipment." (Duhon & Trevino, 2020)

IATA developed RAMPVR, a VR technology that replicates real-life, high-risk scenarios in which people can learn safely. Participants were placed in a variety of scenarios around operational issues such as foreign object debris and marshalling aircraft. In the marshalling module, trainees used VR controllers to perform the correct hand signals used on the tarmac. Using a neural network trained to understand these gestures, participants could signal to aircraft in VR and the aircraft would react as it would at the airport. This enabled a new level of immersion in the training scenario.

"Training using VR provided a faster route to competency development of trainees. Crews of trainees experienced a greater breadth of scenarios resulting in better-trained people at a reduced cost."

Being fully compatible with IATA standards, this VR training was integrated into IATA's training program to complement its classroom-based learning. It has built-in metrics to track and monitor each participant's performance which is then fed to their overall training record. Training using VR provided a faster route to competency development of the trainees. Crews of trainees experienced a greater breadth of scenarios resulting in better trained people at a reduced cost. Training without risk of damage and the opportunity to practice multiple times without tying up expensive equipment were additional outcomes.

Stand Alone or PC-Based VR - 6DOF

Although there are a few pros and cons to stand alone vs. PC-based VR hardware, the general applications are similar.

THIS TECHNOLOGY IS WELL-SUITED TO:

Scenario-Based Training
Need to train someone on a scenario that can't be replicated in real life due to cost or safety concerns? 6DOF VR allows for the creation and implementation of any scenario without real-life consequences. Trainees can practice as many times as needed until they know how to complete a task safely. In these types of training scenarios, everything can be measured down to the smallest safety infraction.

Procedural Task Training
Need to teach someone a new procedure or process in manufacturing? 6DOF is one way to do that without wasting time or material. Use VR to get their skills and knowledge competencies up and reduce the amount of on-the-job training needed. This may help avoid costly mistakes.

Process Design & Improvement
Before building a new assembly line or plant, consider building and testing it in VR with real people. VR provides a chance to optimize the layout as well as reduce inefficiencies and ensure new processes are also designed with human ergonomics in mind. This may avoid unnecessary strain on employees.

Remote Learning & Collaboration
Allows people to feel like they are all in the same room. In this way, VR could be an effective means to teach and collaborate with others remotely.

THIS TECHNOLOGY IS NOT SUITABLE FOR:

Theory-Based Training
Things like mathematics or physics theory that are not procedural and highly theoretical can be costly to develop in VR. The more structured the experience, the easier it will be to create.

Social Skills Training
Character animation and natural voice processing in VR can be challenging. Although AI is rapidly evolving, the technology is not yet able to have life-like conversations with computer-generated characters.

Tactile, Fine Moter Skills
Some things cannot yet be replicated in the digital world. Tasks that take fine motor skills like turning a screwdriver or feeling the way a machine works are not a good use of the current technology.

AUGMENTED REALITY

The most common types of augmented reality are...

Marker Based AR

This type of AR uses a physical marker to trigger an AR experience. Markers can be a simple as a QR code, an image, object or even a face. When the camera recognizes the marker, it triggers and locks down the corresponding digital asset. That way the user can move the camera around while the asset stays fixed in place. Some of the most notable examples of this form of AR include face filters or traditional media AR experiences where a user points their camera at a photo, and it appears to come to life.

Location Based AR

This type of AR uses a geographical location or proximity tag that can sense the distance to a location, often times in combination with a marker to trigger an AR experience. Some of the most notable examples of this form of AR would be Google Maps.

AR experiences can come in different shapes and sizes. Though, fundamentally, every experience needs two things: a quality smartphone or tablet and a digital object. AR is the most simplistic form of XR as it leverages everyday devices.

Here is how we rate the technology....

IMMERSIVENESS & QUALITY

3 OF 5

AR can be useful, but inconsistent

AR feels like looking through a window via a smartphone screen into an immersive world. That immersion is often limited by the screen size and can be inconsistent depending on what type of device is being used.

USABILITY & SCALABILITY

4 OF 5

Ease of Use and Scalability

Since AR leverages existing consumer devices, it is very scalable. It's also relatively easy to use, typically requiring users to download an app and enable camera privileges, operating as a point-and-click experience.

COST & TIME OF RUNNING A PILOT

LESS THAN $50K

Custom can be costly but there are ways to save

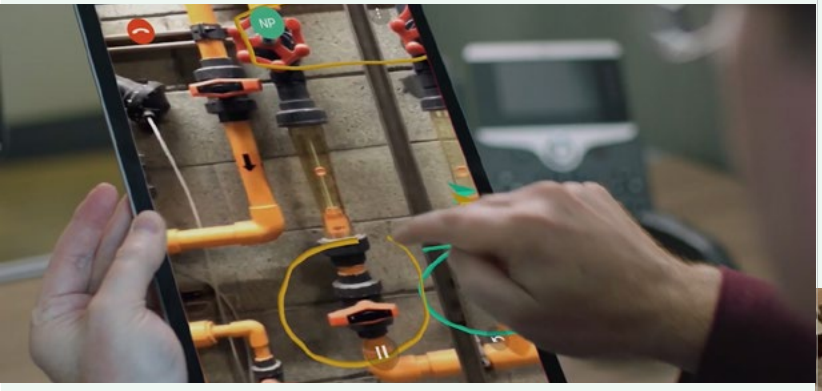
Custom developing an AR experience can be costly. However, this technology has been around for long enough that there are several off-the-shelf apps that can be affordable options.

AUGMENTED REALITY

If custom building an AR experince is out of budget or you want to explore off-the-shelf options, the following are currently available smartphone and tablet applications:

VUFORIA Chalk: Remote AR Collaboration

Vuforia Chalk turns a smartphone into a powerful, visual tech support tool. Once the app connects the user and a co-worker on a video call, the user's rear phone camera becomes a viewfinder to show exactly what they need help with. Both parties can then draw on the screen with AR chalk that works like visual annotations, allowing the user to find the right buttons, dials, and controls without relying solely on verbal descriptions.

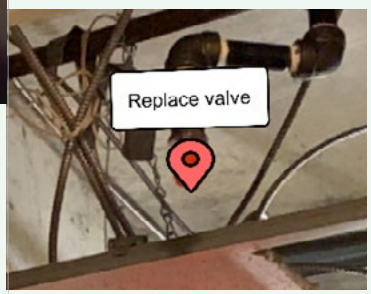


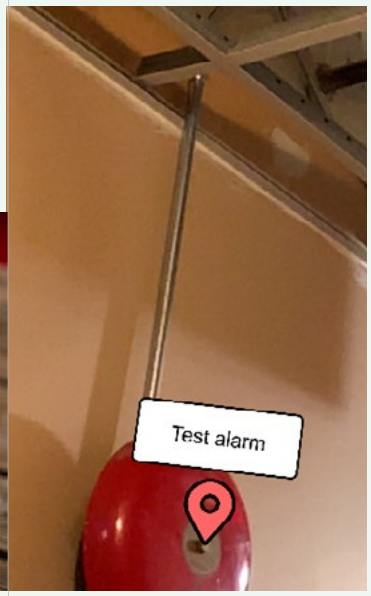
AUGmentecture: AR Viewing of AutoCAD Files

AUGmentecture is softwre that views complex 3D models on a mobile device in an AR format. With the help of the AUGmentecture plug-in, the user can seamlessly and securely upload 3D models and floor plans directly from Autodesk® Revit® to their AUG account to view later. AUGmentecture's goal is to make AR a day-to-day design communication and collaboration tool for architects, designers, and artists.

Placenotes: Creating AR Guides

Placenotes makes it simple to build practical AR experiences that can make the lives of on-site workers easier in the construction, maintenance, manufacturing and inspection industries. The app allows users to create and share AR guides to help a new employee get around or even help someone remember all the key items they need to inspect.





The Pros

AR is scalable as it leverages already owned consumer devices.

AR can be piloted more cheaply than other XR due to off-the-shelf apps.

Newer smartphones allow users to scan objects and rooms, which can be used to create simple, custom apps with little upfront investment.

The Cons

AR experiences can be inconsistent with older smartphones.

Not as interactive or immersive as other forms of XR.

A Real Life Case Study

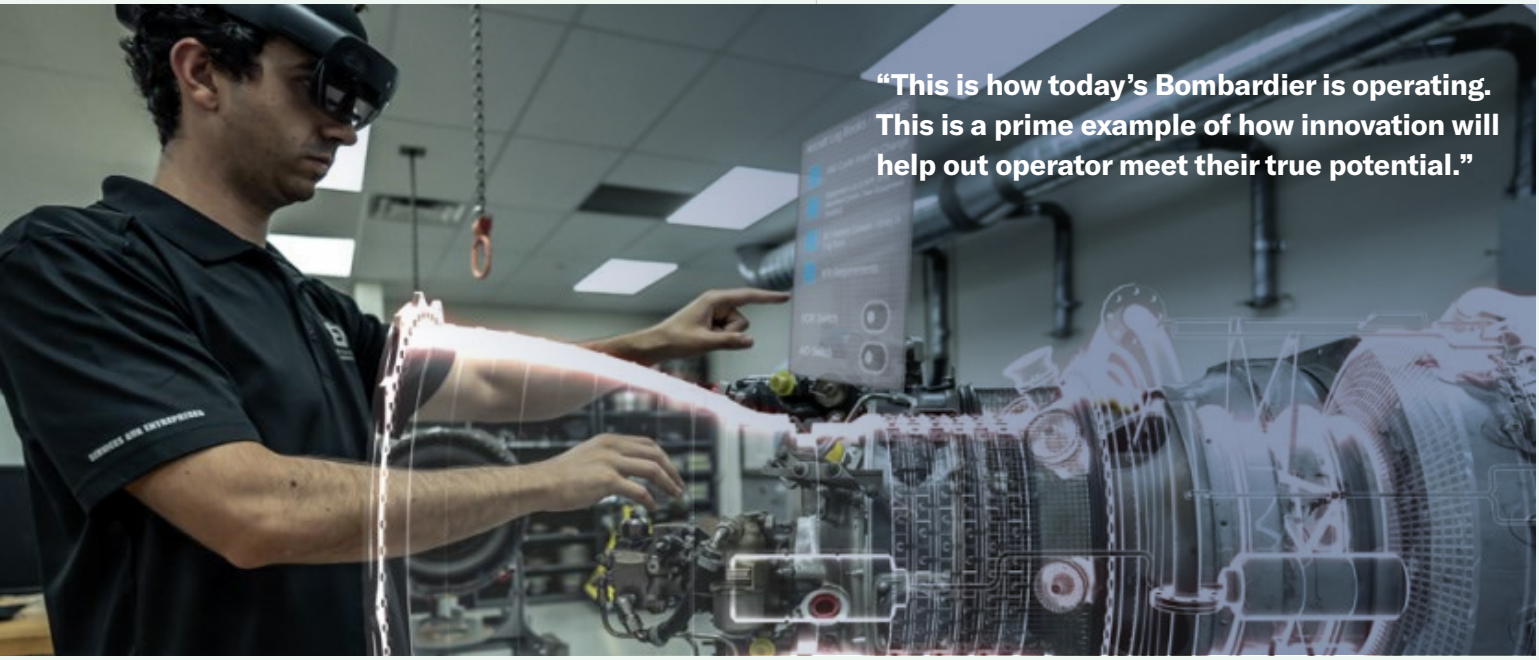
In 2020, Bombardier partnered with OVA and their StellarX platform, working to accelerate the quality inspection and repair process for composite components of an aircraft fuselage.

Inspection is a continuous process, and a key component is a visual inspection, but it is a process that can be cumbersome. Each defect must be individually located and verified by an operator.

By using a composite manufacturing robot to locate any possible defects and sending this information to an AR device, the operator was able to see the overlayed defects and be guided in their work. This was able to save time in the overall process, resulting in increased productivity.

Another real life AR case study can be found in Rolls Royce's customer facing use.

Using the smartphone application Librestream Onsight Connect, staff insert a data gathering probe into an aircraft engine and connect to a trainer from Rolls Royce, the customer engineer can be examine for faults remotely. Using smartphones, each can see and draw on the screen to highlight issues or areas of concern. This virtual presence has sped up inspections for companies and airlines, saving time and money.



THIS TECHNOLOGY IS WELL-SUITED TO:

Visualizing Objects in the Real World
One of the best use cases of AR is seeing what objects might look like in the real world before they are actually put there such as equipment and displays.

Equipment Based Training
AR can provide a way to train someone on a piece of equipment or machinery without needing to study the blueprints. Utilizing this technology can instead allow them to see and interact with complex machinery at scale or even as a tabletop model.

THIS TECHNOLOGY IS NOT SUITABLE FOR:

Interactive Training
Any training that is highly interactive and would require users to do things like select, use tools or grab and place multiple parts would be challenging to accomplish in AR.

Environment Based Training
Scenarios that require a user to navigate a digital environment would be nearly impossible in AR since it's intended to leverage the environment currently around the user. It's best used in object-centred experiences that don't need an environment.

MIXED REALITY

The most common types of mixed reality are...

Smart Glasses - Simple Display

Simple display smart glasses such as Google Glass enable an extremely basic form of mixed reality. These glasses can sometimes see the world around the user, but are limited to displaying basic text or digital information within the field of view.

High-End Mixed Reality - Full Display

High-end mixed reality devices are powerful and project full-color holographic images into the field of view. These devices are outfitted with enough sensors to give the device a basic understanding of the world around the user. Digital objects can be placed on tables and knocked off by a user pushing them with their hand. These types of devices blend the digital and real-world together, making it difficult for the user to tell what is real and what is digital.

Although there are many devices on the market advertising as mixed reality headsets, only a few come close to offering a true MR experience. The Microsoft HoloLens and the Magic Leap 2 are the two best high-end devices currently on the market.

Here is how we rate the technology....

IMMERSIVENESS & QUALITY

4 OF 5

Immersive with only field of view limitation

True mixed reality makes it hard for users to tell what is real and what is not. The only notable limitation on the technology is the field of view that can break the immersion if the user stands too close to a digital object.

USABILITY & SCALABILITY

3 OF 5

Easy to use but costly scalability

Mixed reality is relatively easy to use as it is typically a single worn headset with software controlled by simple hand gestures. There is, however, a small learning curve.

COST & TIME OF RUNNING A PILOT

LESS THAN $25K

Custom can be costly but there are ways to save

The most practical use cases of mixed reality can be achieved with off-the-shelf apps whcih makes it cost-effective on the software side. Sometimes custom 3D assets can be developed to be added to these existing apps. Additional limitations are in the cost and fragility of the device (based on a $5,000 per headset cost).

MIXED REALITY

Beyond custom building 3D assets, most practical applications of mixed reality can be implemented using off-the-shelf apps.

Dynamics 365 Remote Assist

Microsoft's Remote Assist allows users to share a real-time view with experts remotely to get the necessary help needed while staying hands-free. This app also enables experts to make spatial annotations similar to Vuforia Chalk mentioned previously under AR apps.

Dynamics 365 Guides

Microsoft Dynamics' 365 Guides is a mixed reality application for the Microsoft HoloLens 2 that helps operators learn during the flow of work by providing holographic instructions when and where they're needed. These instruction cards are visually tethered to the place where the work is to be done and can include images, videos, and 3D holographic models. Because operators see exactly what needs to be done, and where, they have the potential to get the job done faster, with fewer errors.

The Pros

The experience enables truly hands-free computing as the device is controlled primarily through hand gestures.

Users can do many of the same tasks in a mixed reality device that they could do on a smartphone or computer.

The Cons

Hardware is expensive at over $5000 per unit.

Limited to simple interactions.

Current hardware has a small field of view, which can take away from the immersiveness of the experience.

A Real Life Case Study

Using the Microsoft HoloLens, technicians working with Siemens' are able to view all the relevant information needed to prepare vehicles for operation anywhere. The service employee has full access to all necessary documents and information through the mixed reality interface. The interface guides technicians through service reports and prompts them on all necessary measurements needed for report implementation. Technicians use audio commentary to document and record results making them immediately available to all other departments.

If technicians run into issues while completing a report, mixed reality makes it possible to remotely collaborate with experts anywhere in the world. The photo below shows what a remote collaboration session with MR looks like. The technician wearing the headset can see the person they are calling in an interface that can hover directly above the work surface. The person on the other end can see exactly what the technician is seeing through the cameras on the front of the headset. During a call, the spatial annotations can be drawn in by the person on the other line further helping the technician quickly navigate the intricacies of their machinery.

Technicians at Siemens completed maintenance tasks much faster and more accurately, minimized human error, and immediately recorded service reports in the field using MR glasses.

THIS TECHNOLOGY IS WELL-SUITED TO:

Real-time remote support
No more flying a specialist in to solve complex problems or troubleshoot issues. With mixed reality devices, users have the ability to wear a device and bring the expert to them digitally from anywhere.

On the job training
If a user needs to train someone on the job for complex tasks or muti-step inspections, mixed reality can be used to create digital standard operating procedures that employees can use as guides while on the job.

THIS TECHNOLOGY IS NOT SUITABLE FOR:

Environment Based Training
Similar to AR, any scenario that would require a user to navigate a digital environment would be nearly impossible in mixed reality since it is intended to leverage the environment around the user. It is best used in object-centred experiences that don't need an environment.

This table provides considerations regarding which XR technologies might be best suited to particular areas of aerospace technical training today, based on the evolving nature of the technology.

	360 Video & Photo	Stand Alone VR	PC VR	Augmented Reality	Mixed Reality
SUMMARY OF RATINGS					
Immersiveness & Interactivity	**2**	**3**	**4**	**3**	**4**
Usability & Scalability	**4**	**4**	**3**	**4**	**3**
Cost of Running a Pilot	**< $25,000**	**$100,000 +**	**$100,000 +**	**< $50,000**	**< $25,000**
Lead Time for Pilot	**~ 2 Months**	**4+ Months**	**4+ Months**	**~ 4 Months**	**~ 2 Months**
POSSIBLE APPLICATIONS					
Safety Training	✔	✔	✔	✖	✔
Conducting Inspection	✖	✖	✖	✔	✔
Procedural	✔	✔	✔	✔	✔
Training others	✖	✔	✔	✖	✔
Diagnostic	✔	✔	✔	✔	✔
Repetitive tasks	✖	✔	✔	✖	✔
Group training	✖	✔	✔	✔	✔
New hire – work environment	✔	✖	✖	✔	✔
Foreign Object Debris (FOD)	✔	✖	✔	✖	✖
Aircraft familiarization	✔	✔	✔	✔	✔

What to consider when looking at **XR Technologies**

Extended reality is going to continue to rise as new products, innovations, investments and use cases emerge.

As the hardware evolves, costs will go down, more devices will become available and more creators will emerge to develop off-the-shelf tools or training scenarios that can be utilized by companies in all industries, including aerospace. One of the most likely forms XR will take in the future is that of a hybrid device, with which a user can seamlessly switch between all types of XR, making it more versatile and scalable. Devices will also heavily rely on other transformative technologies like AI and 5G to make them more effective.

XR won't replace educators. Instead, it will serve as a tool to help you further enhance what you do best, while allowing you to better connect with the next generation of learners.

Before diving headfirst into XR, it's important to consider a few things that will help avoid costly mistakes and ensure focus on what really matters.

1

UNDERSTAND THE AUDIENCE

There is a wide range of XR technologies and applications available for businesses to utilize. It is important to understand that some populations will be more receptive to using new technologies than others. XR can be incredibly beneficial for youth, people with disabilities or those who struggle to absorb knowledge through traditional teaching methods such as sitting in a classroom or reading training manuals. Understanding who the end user will be, and including them in the conversation early on, will help determine which technology will be the best fit.

2

DEFINE THE OBJECTIVES

It is vital to clearly understand the problems that need to be solved as well as what technology should be utilized to solve them. Like all tools in a tool belt, XR can be beneficial in some areas and less so in others. For example, XR is for things like safety training or remote support. Whereas teaching someone how to use basic hand tools or perform tasks that require fine motor skills might not be a good fit if it lacks tactile feedback.

3

BUILD A GOOD TEAM

Consider working with XR companies or industry experts to help you quickly navigate the landscape, focus on the most impactful areas first and avoid costly mistakes. Many companies will offer free consultation that could also help you quickly understand if XR is a viable solution based on your budget and needs.

4

BE FOCUSED AND STRATEGIC

Starting slow is critical to the success of new technology rollouts. These technologies and their capabilities will help you develop an in-depth understanding of it and get you thinking about where and how to use it. When it comes to selecting the physical hardware, it can get overwhelming. Reputable brands might be more expensive than the alternatives, but at the end of the day, usability and stability is key. Always start with one and test it thoroughly.

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