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UBiMAX
Ubiquitous Computing Experts

VISION PICKING
WITH INTEL® RECON JET™ PRO

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Introduction: The warehouse environment and the order picking process

Over 50% of the labor resources in a typical warehouse are involved in the task of picking.

Picking is a costly and labor-intensive activity critical to warehouse operations. As such, it is typically the first area logistics professionals look to improve efficiency and cut costs.

Over a third of the global workforce is now mobile. That is 1.3 billion deskless workers who need their hands free to do their jobs ***better, faster, safer, and more accurately.***[1] Logistics workers are classic deskless workers, with their workplaces being warehouses and distribution centers. These work environments – characterized by bustling human activity and precisely coordinated processes – are prone to inefficiencies, inaccuracies, high costs and even safety hazards.

As more orders with smaller quantities, shorter delivery times and superior customer service become the standard, logistics professionals are under pressure to reduce labor costs and other operating expenses while simultaneously increasing efficiency, accuracy and productivity within their facilities. In these times, technological innovation is absolutely necessary to compete and grow.

Warehousing operations are estimated to account for approximately 20% of all logistics costs. Picking, or the activity of pulling items from inventory in a warehouse to fill customer orders, accounts for at least 55% of the total operational costs.[2] In addition, over 50% of the labor resources in a typical warehouse are involved in the task of picking, along with packing and shipping outbound orders.

This makes order picking **the single most costly and labor-intensive activity in the whole supply chain.** It is also the most customer-sensitive, many times defining the quality of service experienced by customers: A mistake or delay at this stage is what is visible to the end customer and typically results in high follow-up costs.

As a result, order picking is one of the most controlled processes in a warehouse. Logistics professionals are continually seeking to improve and optimize picking through the introduction of new technologies.

1. International Data Corporation. Worldwide Mobile Worker Population 2011-2015. 2012 (Updated 2016.) February 2017. http://www.idc.com

2. De Koster, René et.al. (2006): Design and control of warehouse order picking: A literature review. European Journal of Operational Research. 182(2): 481–50

2

Pain points: The order picking process and the drawbacks of current solutions

"The picker is the indispensable link that bridges the gap between producer and consumer... Any error on the part of the picker tarnishes the reputation of the producer, creates an additional burden on the supply chain to fix the issue, and ultimately disappoints the customer."

– Trever Ehrlich
Creative Solutions Manager, Kenco Innovation Labs

Successful order fulfilment in a distribution center is dependent upon human speed and accuracy. Efficiency and precision define success in this world of strict timelines and delicate profit margins. A few additional seconds to scan a barcode or a wrong pick that goes unchecked can be detrimental to the organization's bottom line.

The success of a warehouse's picking operations ultimately depends on the synergy of a number of factors. These include the layout of the facility, item labeling, and the order picking strategy (i.e. piece, batch, zone or wave picking.) But, arguably, the most important factor is the human one—the human order pickers, and the technology and tools with which they navigate large and complex warehouses and locate items among the aisles of shelves and bins.

When there are thousands of picks to perform per hour, order pickers must be as fast and accurate as possible while fulfilling multiple orders at once. The work is demanding—pickers are constantly in motion, often traveling on foot, pushing carts around the warehouse, grabbing and placing items, and repeating the many small movements involved in retrieving and verifying orders. The challenges grow during peak periods, when temporary workers have to be trained at great expense to ensure they pick without making mistakes.

Technologically enabling these workers is a must: **Provide warehouse pickers with the right tools for the job and they will be able to work with speed and precision no matter their level of experience.**

Wearable technologies – the latest in innovation – are not new to logistics: For decades, warehouse workers have used arm-mounted computers, ring scanners and headsets. The older solutions, however, leave much to be desired, vulnerable as they are still to errors and inefficiencies which impair productivity. Let's review them:

Paper picking

Among the various ways in which an order may be communicated to a picker, the paper pick list is the oldest and least efficient, so it might surprise you to learn that many warehouses still employ the pick-by-paper approach.

In paper-based picking, the worker receives a printed list of items to pick which he or she carries around the warehouse, usually filling one order per run and using a pen to check off when an item has been found.

It's not hard to imagine how wrong picks can go undetected when the picker must continually go back and forth between reading/recording and product handling.

POSITIVES: Low cost of entry

NEGATIVES: Slow, error-prone (no verification or accountability involved), not heads-up or hands-free, not electronic (no automatic inventory updates or metrics obtained)

A picker looks down at the screen of her handheld RF unit to view the next assigned order. When she arrives at the given location, she holds up the device to scan a barcode on the shelf before her, and she also scans the item before placing it on her trolley. Each time she makes a pick and while on the move between locations, the operator either puts down or awkwardly balances the device. To confirm a pick, she manually enters information via the terminal's keypad.

RF scanning

While the radio frequency (RF) scanner is a big upgrade from the paper pick list, its most serious drawback is that it must still be held in one hand. Picking is a fast-paced, hands-on activity, so having to use one's hands for anything other than to move inventory, like to hold a barcode scanner or perform keyboard input, is inherently inefficient.

The use of a handheld clearly inhibits picking performance: The picker wastes time juggling the device, is slowed down by multiple scans and keyboard verification, and can develop disabling repetitive strain injuries due to the poor ergonomics of the device.

POSITIVES: Faster picking speed compared to paper, better tracking and inventory management, rugged technology

NEGATIVES: Cumbersome (not heads-up or hands-free), manual data entry required (disruptive to workflow), difficult to use (steep learning curve), not error-proof, RSIs lead to worker downtime and increased workers' compensation fees

To make logistics operations future-ready and meet the increasing demands of e-commerce, better order picking technology aids are needed.

Photo: http://www.wikiwand.com/de/Pick-by-Light

Pick-by-light

Many distribution centers employ a light-directed picking scheme in which lights integrated into the storage system (ex. installed above the racks or bins) indicate to pickers where the items for an order are located. A combination of indicator lights, LED displays, and buttons informs the picker where a target item lives along with the quantity to pick, and allows him to confirm his actions. Additional scanning may also be incorporated to reduce errors.

The major downside to this kind of picking solution is that it requires special modification to the warehouse's infrastructure. Implementation is therefore costly and once the hardware is installed, it's extremely difficult to rearrange the facility. And like the previous solutions, it relies upon the human order picker verifying herself that an order has been completed.

POSITIVES: Mostly heads-up and hands-free, intuitive and language independent

NEGATIVES: Expensive to install, inflexible, still not 100% error-proof

Pick-by-voice

In voice-guided picking, warehouse workers wear headsets with a built-in microphone; they receive audio instructions and confirm tasks verbally to complete a pick. While this leaves the operator's hands free to perform the pick, the constant voice interaction plus having to memorize and interpret voice commands calls for intense concentration.

Walking around a warehouse all day is tiring, and tired people make mistakes. Now ask those people to remember verbal directions and repeat back a SKU in the middle of a noisy distribution center—slip-ups are bound to happen.

POSITIVES: Heads-up and hands-free, supports multiple languages, voice recognition technology is improving

NEGATIVES: Can be draining (giving rise to inaccuracies, slower picking), not suitable for loud environments or high picking densities

Each of the choices above has its shortcomings, which continue to result in inefficiencies in a warehouse's order processing operations. And while today's picking error rate is low thanks to solutions like the mobile RF scanner and voice-automated systems, seconds adding up to minutes are still being lost on a daily basis in the picking process and bad picks do still make it out of the warehouse, costing companies dearly. To make logistics operations future-ready and meet the increasing demands of e-commerce, better order picking technology aids are needed.

Enter Intel Recon Jet Pro smart glasses, a new efficiency driver for logistics professionals. Jet Pro is the leading heads-up, hands-free wearable device for optimizing performance in the order picking process, with a comfortable, ruggedized form factor ideally suited for warehouse workers on the go.

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The next generation of wearable technology in the warehouse: Vision picking with Intel Recon Jet Pro

Pick-by-vision is the latest advanced order picking solution.

Pick-by-vision is the latest advanced order picking solution, featuring Augmented Reality (AR) smart glass technology, which makes picking a truly heads-up and hands-free activity for the first time. Recognizing the improved efficiencies and decreased error rates driven by augmenting warehouse workers with smart eyewear, the world's leading logistics companies are testing out vision picking at their major distribution centers.

What is vision picking?

In vision picking, order pickers wear smart glasses powered by special augmented reality (AR) software tied into the company's warehouse management system (WMS.) Simple text and graphics in the heads-up display – superimposed on the picker's field of view (FOV) – provide real-time order details, showing the worker where to go and what to pick, and verifying picks via barcode recognition.

Throughout an entire batch of orders, the user gets to keep her eyes and hands engaged in the task of picking, allowing her to work both faster and with more certainty.

What sets vision picking apart from previous order picking solutions is that **the technology (i.e. smart glasses) is perfectly in sync with the natural motions and ergonomics that accompany a worker's routine picking process.** Easy-to-follow visual cues displayed directly in the picker's FOV guide him through the warehouse environment; only the most pertinent information needed to carry out the pick is displayed in the glasses, including location information (aisle number, shelf position) and product quantity. The solution then validates the pick using the glasses' embedded camera as a barcode reader, or a Bluetooth-connected ring scanner may be used for even greater flexibility.

"While the picker is busy moving product, driving lifts or pushing carts, the last thing she needs is a clumsy clipboard, fragile tablet, or bulky wrist scanner to interfere with her work. Yet it's what hundreds of thousands of workers put up with daily. Smart glasses promise a hands-freeing solution to allow an employee to work unimpeded."

– Trever Ehrlich
Creative Solutions Manager, Kenco Innovation Labs

With vision picking, it's also possible to point out the most efficient route for the order picker to take to get to an item along with the optimal position on the picking cart to place it. And the whole solution is contained in the smart glasses; there's nothing to hold or memorize, enabling workers to pick more orders with minimal errors.

Advantages:

- Completely heads-up and hands-free (maximum mobility and flexibility)
- Verification is a feature of the solution (eliminates errors)
- Streamlined, seamless order picking (uninterrupted workflow, shorter pick retrieval time, higher pick rate)
- Intuitive to use (minimal training time required)
- Potential low cost of ownership (can be adopted in any warehouse setup without major modifications)
- Safer workplace (fewer repetitive strain injuries)

Moreover, vision picking with smart glasses is the order picking method preferred by warehouse workers, given the opportunity to try the technology.

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Elevating the Vision Picking Experience with Intel Recon Jet Pro, Smart Glasses for the Connected Workforce

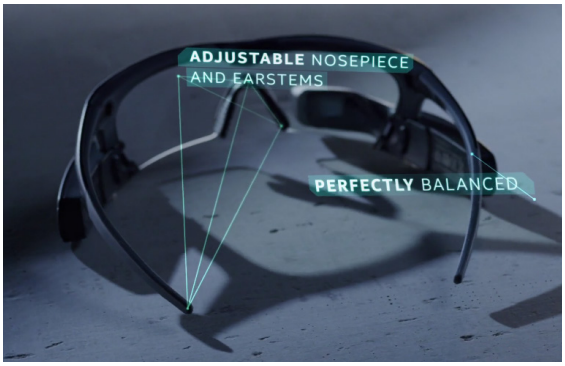
Smart glasses promise a much improved user experience over the old, basic handheld scanner and voice solutions in the warehouse; but there are many hardware options currently on the market, certain models being better or worse for certain enterprise applications like vision picking. For instance in many cases, glanceable smart glasses like Jet Pro, which offer mission-critical information at a glance, are preferable to binocular (2D overlay) devices and Mixed Reality headsets, since they're lighter, cheaper and have a longer battery life. No matter the use case, however, the primary factor in assessing smart eyewear for enterprise use is the device ergonomics. Wearability is key, and in this respect Intel Recon Jet Pro smart

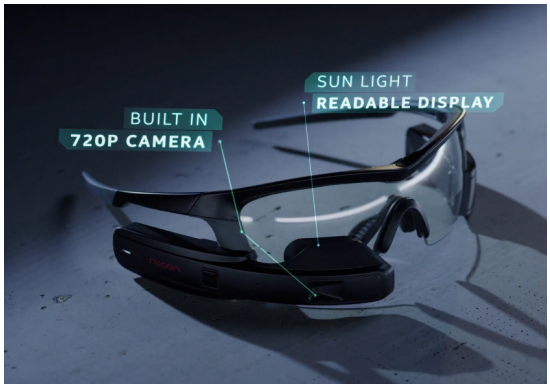
glasses are unrivaled. Built from the ground up for optimal comfort and wearability, **Jet Pro offers uncompromising ergonomics,** without which the productivity benefits and desired efficiencies of adopting vision picking would be impossible to realize:

- **Completely standalone device**
- **Balanced and lightweight:** Weight distributed evenly across the frames
- **Fully adjustable nosepiece and ear stems:** Comfortable fit for nearly all head shapes and sizes
- **Prescription-ready:** Custom lenses can be easily installed and removed between shifts for workers who wear prescription glasses

Jet Pro isn't only supremely comfortable to wear; it's also a highly dependable and versatile device. **With its ruggedized design, Jet Pro stands up to the rigors of any industrial environment,** including the warehouse:

- **Outdoor-optimized build:** Sunlight-readable display, water-resistant components, and easily swappable lenses for indoor and outdoor work
- **Fully field-swappable battery:** Spare batteries can be exchanged and workflow resumed in under a minute; each battery provides 2-5 hours of run time
- **Patented Glance Detection technology:** Display can be configured to power on only when needed to save battery and minimize distraction
- **Impact-resistant clear lens:** ANSI Z87.1- and IP65-compliant





With smartphone-class capabilities, an integrated video camera, and an operating system that supports the leading software solutions for enterprise wearables, **Intel Recon Jet Pro smart glasses can handle the most demanding industrial applications:**

- **Computing power & connectivity:** Equipped with smartphone-class computing and software capabilities; Bluetooth-, Wi-Fi- and GPS-enabled
- **Camera & video:** Point-of-view camera enables hands-free barcode scanning, documentation of high-stake work procedures, and see-what-I-see video calls in remote guidance and collaboration scenarios
- **Integration & security:** Fully customizable turnkey solution that can be tailored to meet an enterprise's unique business needs; plug-and-play deployment enabling rapid ROI
  - Smartphone-class operating system and open, publicly available developer tools
  - Partnerships with industry-leading software and ISV providers whose solutions comply with the latest information security guidelines
  - Compatible with major mobile device management (MDM) solutions and industry-standard enterprise resource planning (ERP) systems
- **Price point:** Optimal choice for pilots and proof-of-concepts at nearly half the price of its competitors (Jet Pro start at $599.00).

Jet Pro isn't only supremely comfortable to wear; it's also a highly dependable and versatile device.

Modern distribution centers are judged on the accuracy and efficiency of their order processing operations. The use of smart glasses and Augmented Reality can measurably optimize these operations. Case in point: Intel's own distribution center in Chandler, Arizona, where Intel Recon Jet Pro was recently put to the test.

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Case study: The Intel Arizona Distribution Center (ADC)

"I've actually used the scan guns on the ladder and it doesn't feel safe. [With glasses on a ladder,] I'd feel a whole lot safer since I can use both hands."

– Contract Floor Worker, *Intel Arizona*

"I like the idea of not having the hand scanner. I definitely like that. That always got in the way in some form, either equipment or machine operating or just handling product."

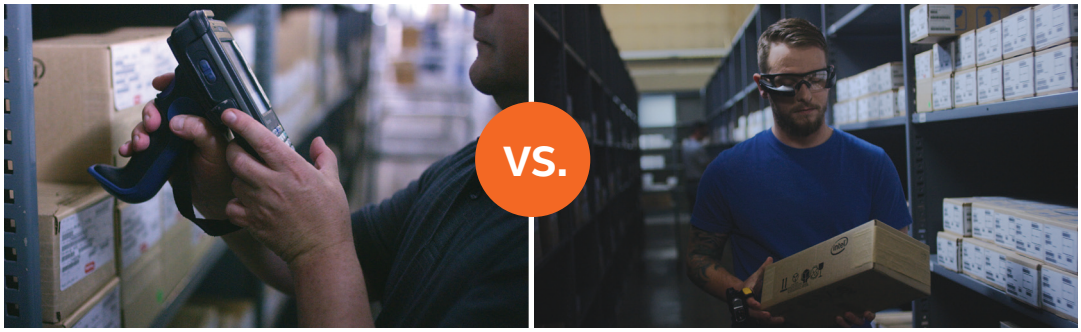
– Contract Floor Worker, *Intel Arizona*

Jet Pro is optimizing picking performance and enabling state-of-the-art order processing within Intel's own worldwide distribution center in Chandler, Arizona.

Like other enterprises with complex supply chains, the technology giant Intel is continually striving to improve efficiency in its worldwide distribution centers. With that goal in mind and in partnership with German start-up Ubimax, the company implemented its Recon Jet Pro smart glasses at its facilities in Chandler, AZ to test the benefits of vision picking first-hand.

The pilot at Intel Arizona pitted Jet Pro smart glasses – in combination with a wearable ring scanner and powered by Ubimax's xPick software – against the current handheld RF scanner used in the distribution center. Over the course of several weeks, two Jet Pros and two handheld scanners were used to fill live orders. Similar pick lists were provided to all the order pickers involved, with those wearing Jet Pro receiving the list on the heads-up display. **In 120 test picks, Intel Recon Jet Pro not only proved its ergonomic superiority but also drove significant efficiencies, including a 29% faster pick rate per box.**

RF Picking vs. Vision Picking at the Intel Arizona Distribution Center (ADC)



Picking small parts on foot is a basic yet intensive process. Pickers at the Intel ADC have been using handheld RF units that combine both scanning and manual data entry, which in many ways makes the process more tedious and difficult.

"My biggest issue with the hand [scanner] is it's bulky...Having to put it down, pick it back up, put it down. It's a hassle."

—Justin Laughridge, *Floor Manager, Logistics Professional, Intel Arizona*

"[You've] got to scan multiple places. I don't like how much information I have to constantly put in. There's extra information that's not needed."

—Tony Brown, *Warehouse Picker, Logistics Professional, Intel Arizona*

The scanners used by Justin, Tony and their colleagues are larger than a smartphone. When you observe these workers on the job, you can see that it is impossible for them to carry out their work seamlessly while operating the device.

Pickers must stop and look down at the handheld display to view each order; and, as Justin described, they must repeatedly put down the unit and pick it back up to push their carts, scan items, take boxes off shelves, and enter information with a keyboard. In all that extra effort, time is wasted and workers become distracted and forgetful.

It's understandable why the Intel ADC pickers were eager to trade in their handhelds and try something new. They not only instantly understood the appeal of a heads-up display but they also required next to no training time to begin picking with Jet Pro.

A major problem with the RF scanners at Intel Arizona (other than that they're not hands-free) is that they don't present information intuitively; they show a lot of information that to a novice worker makes little sense without in-depth training, and that's not all necessary. Vision picking with Jet Pro is much more user-friendly: The hardware is more ergonomic, and the way information is conveyed to the user is more natural and intuitive—a "show, don't tell" approach. This is achieved with the software solution developed by Ubimax, which boasts an innovative graphical UI design that complements the heads-up form factor.

"Right from the start when I put [the glasses] on, I just got it instantly. It was like, 'Oh, I don't need an explanation. I got this.'"

"Jet Pro only shows us the information that we currently need. It shows us the location that we need to go to and what we need to scan, which overall makes us faster."

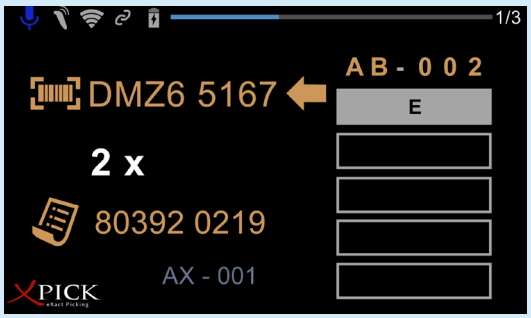
xPick is Ubimax's innovative pick-by-vision software platform supporting manual order picking, incoming, outgoing and sorting of goods as well as inventory management. Running on Intel Recon Jet Pro, the xPick application shows only relevant task information to the user, directly in her line of sight, so that she instantly comprehends what to do.

When using smart glasses the need for carrying bulky hand scanners becomes obsolete. Having the relevant information always right in front of the eye, and having intuitive interaction methods leads to less stress and makes our xPick solution superior to [the] often confusing hand scanners."

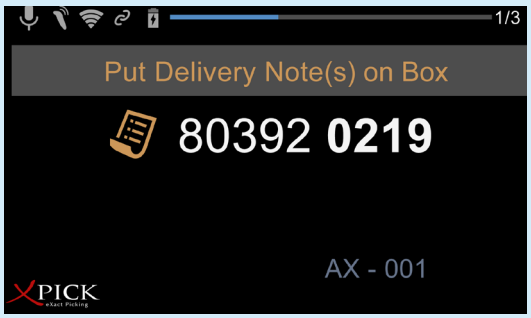
—Percy Stocker, *COO, Ubimax*

A handheld display provides an overwhelming amount of textual information; using the Jet Pro/Ubimax solution, warehouse pickers are given a simplified graphical representation of the pallet shelf and items to be picked. The user is able to visualize the exact location of the pick based upon what is shown in the smart glasses: The shelf position is highlighted and the aisle location clearly denoted on the right side of the xPick interface, while on the left appears the box code, total number of parts to be transferred, and the next picking location. The worker absorbs this information all while looking straight ahead and keeping his hands free to perform the actual pick. To confirm picking of the correct item, he need only scan the product or location barcode with a ring scanner before moving onto the next order.

*Views of the **Ubimax xPick** interface as seen through **Intel Recon Jet Pro** smart glasses. The design is universally intuitive and easy to follow, showing only necessary information to get the pick right.*



1) At right, the aisle location (AB-002) appears above a simple diagram indicating the shelf position (E) of the item. At left is shown, from top to bottom: The box code, the number of items to pick, the correct delivery note to put on the box, and the next pick location.



2) The software reminds the picker to place the delivery note on the box before walking to the next location.

Intel ADC workers cut picking time by **15%** on the first day of use. By the end of the month, there was a **29%** decrease in picking time per box.

Vision Picking with Recon Jet Pro Smart Glasses: Observations, Analysis and Feedback from the Intel ADC

After only a short introduction to Jet Pro and the Ubimax xPick application, Intel workers were completely comfortable using the technology. The first-ever pick performed with the glasses saw a 15% decrease in picking time. By the end of the first month, that number improved to a 29% decrease in picking time per box picked compared to the prior handheld scanner solution.

Recon Jet Pro in combination with the Ubimax software proved to be an intuitive and efficient solution.

"The real benefit that we got from using [Jet Pro and] an interface like xPick is the fact that workers can be brought in during peak periods and immediately start being efficient."

—Chelsea Graf, *Enterprise Wearables Director, Intel Corporation*

"It doesn't take a lot to train on these glasses, it's pretty obvious what you should be doing."

—Justin Laughridge, *Floor Manager, Logistics Professional, Intel Arizona*

Moreover, user acceptance was very high. The order pickers wearing Jet Pro positively attested to the improvements and efficiencies brought by the head-worn technology, including the greater speed and flexibility with which they were able to carry out tasks and the elimination of errors. In observation, workers appeared more agile, focused and sure of their actions with the smart glasses due to the fact that they didn't have to look down while they worked or remember complex information.

The bottom line in a supply chain is the quicker an order can be retrieved, the sooner it becomes available for shipment to the customer. With heads-up augmented reality support, warehouse workers can fill orders faster than ever before, with perfect accuracy. **Intel Recon Jet Pro and Ubimax's xPick application optimize the logistics of order picking, thereby increasing productivity in the warehouse and boosting customer satisfaction.**

5

LEARN MORE: The future of Intel Recon Jet Pro smart glasses in the warehouse and beyond

Within the crowded smart eyewear sector, Intel Recon Jet Pro stands out thanks to its ergonomic design, rugged build and low price, as well as the range of capabilities possible with partner software solutions.

The ergonomics, wearability and ruggedness of Jet Pro make it ideal for addressing inefficiencies and improving processes all along the supply chain, but the applications extend beyond logistics to field service, maintenance, and more.

Despite efforts to automate large areas of a warehouse's operations, human labor remains vital to most logistics processes. The same can be said in most other industries, for human workers are uniquely capable of adapting to different situations and requirements. The goal of adopting emerging technologies, therefore, should be to empower these workers to acclimate more quickly, to augment their abilities and help them perform at a higher level by giving them richer information with better tools.

Smart glasses are going to become indispensable tools in many workplaces, providing mobile workers from the warehouse to the field with hands-free abilities and access to information so they can multitask more effectively, learn in real time, and collaborate from anywhere in the world. Forrester Research predicts smart glasses will be in use by 14.4 million U.S. enterprise workers by 2025; and in the field service industry alone, Gartner has projected $1 billion in yearly cost savings from smart glasses adoption starting in 2017. **Within the crowded smart eyewear sector, Intel Recon Jet Pro stands out thanks to its ergonomic design, rugged build and low price, as well as the range of capabilities made possible by key software partnerships such as Ubimax.** These abilities include:

- See-what-I-see video calls
- Video & image capture and sharing
- Step-by-step instructions
- Live tasks
- Checklists & notifications
- Barcode scanning (item recognition)
- GPS navigation/geolocation
- Voice commands & dictation

In addition to order picking, Recon Jet Pro can optimize logistics workflows such as receiving, packing, shipping and replenishment in the warehouse. Beyond logistics, Jet Pro can dramatically transform workflows in industries like field service, manufacturing and even first responders by enabling workers to access mission-critical information, be guided by domain experts from anywhere in the world, and interface with remote ERP systems in real time without taking their eyes or hands off the job.

As we saw with vision picking, the introduction of Jet Pro to critical business processes drives significant operational efficiency gains and corresponding cost savings, including shorter task completion times, accelerated employee training, reduced error and rework rates, improved safety, and minimized downtime.

To learn more about empowering your organization at the worker level with **Intel Recon Jet Pro** smart glasses, visit: http://www.reconinstruments.com/enterprise/jet-pro/

Ubimax is a leading supplier of enterprise computing solutions for wearables. Visit: http://ubimax.com/

SMART GLASSES

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