

WINGMAN

Advanced augmented reality safety glasses increasing line maintenance efficiency

The Problem

In aircraft line maintenance,

Referencing materials and reporting work accounts for **30% of daily tasks**^[1]

20.7% of maintenance-related incidents related to incomplete maintenance records^[2]

Cost of maintenance and ground crew errors estimated at **2 billion dollars / year**^[3]

Current Practices

Physical referencing of ETM materials

Manually written maintenance logs (electronic/physical)

Inconsistent standards between hangars, companies, and countries

Innovative Functions

Augmented reality (AR) display in ANSI-compliant frame

Semantic vocal queries provide relevant ETM materials

Replaceable components due to part-independent construction

Photo-based scrubbing of prior maintenance reports

Automated reporting system utilizing vocal transcription from user

On-board storage of relevant manuals and prior maintenance history

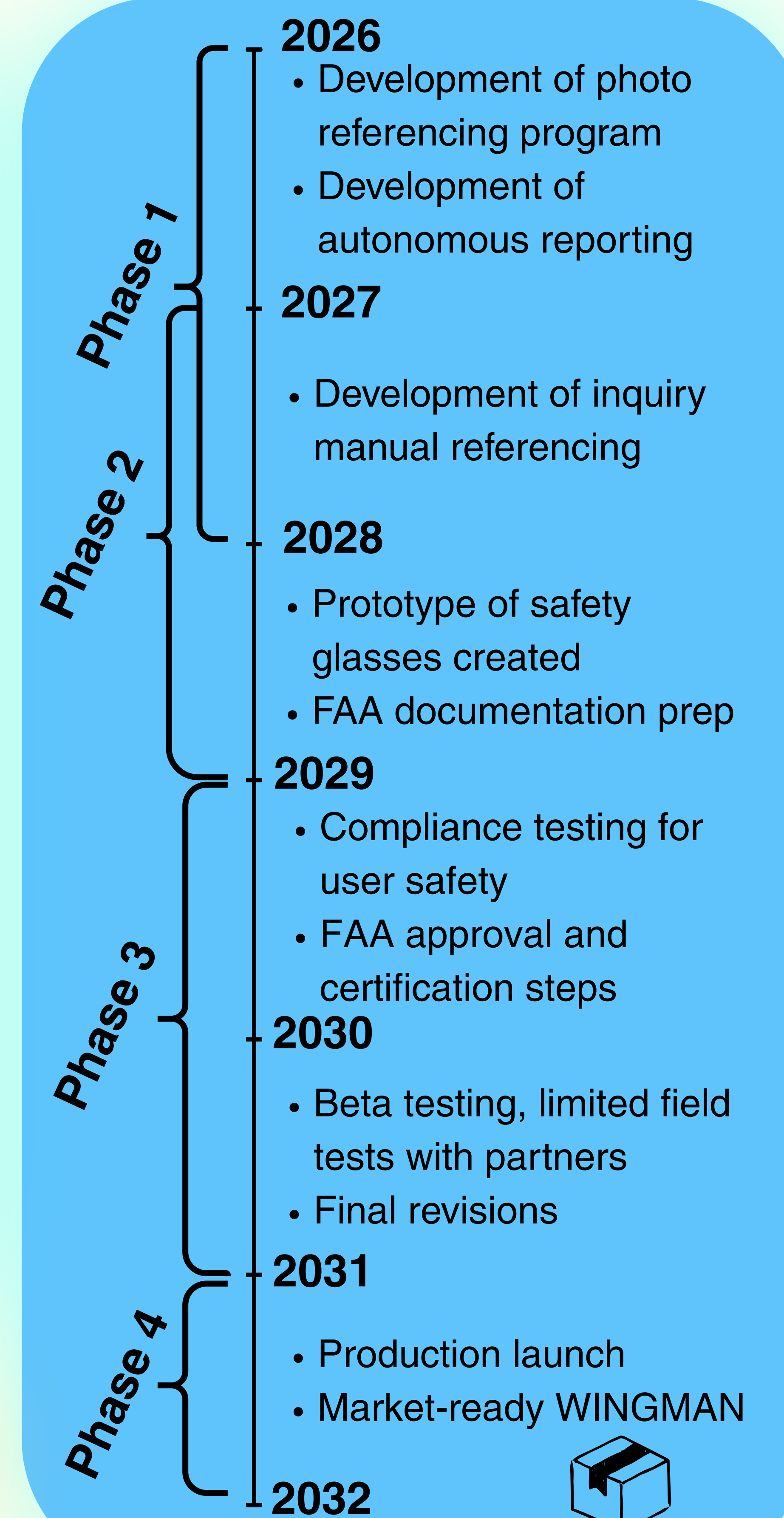
Impacts and the Future

Use of AR in maintenance can:
 Increase efficiency by up to 40% | Reduce procedure errors by 75%
 Savings of **\$60,835** and **17 business days / year**, per pair of glasses
 For example, with 6,647 AMT's at Delta, = **\$402M** in annual savings

Savings Category	Time Savings (Hours)	Annual Savings
Inspections & Reporting Time	90	\$4,174.20
Reworks	18	\$834.84
Delays	1.5	\$9,028.10
AOG Duration	0.6	\$48,000.00
Unnecessary Movement	36	\$1,669.68
Cost of Glasses	N/A	-\$2,500.00
Onboarding	-8	-\$371.04
TOTAL ANNUAL SAVINGS	138.1	\$60,835.78

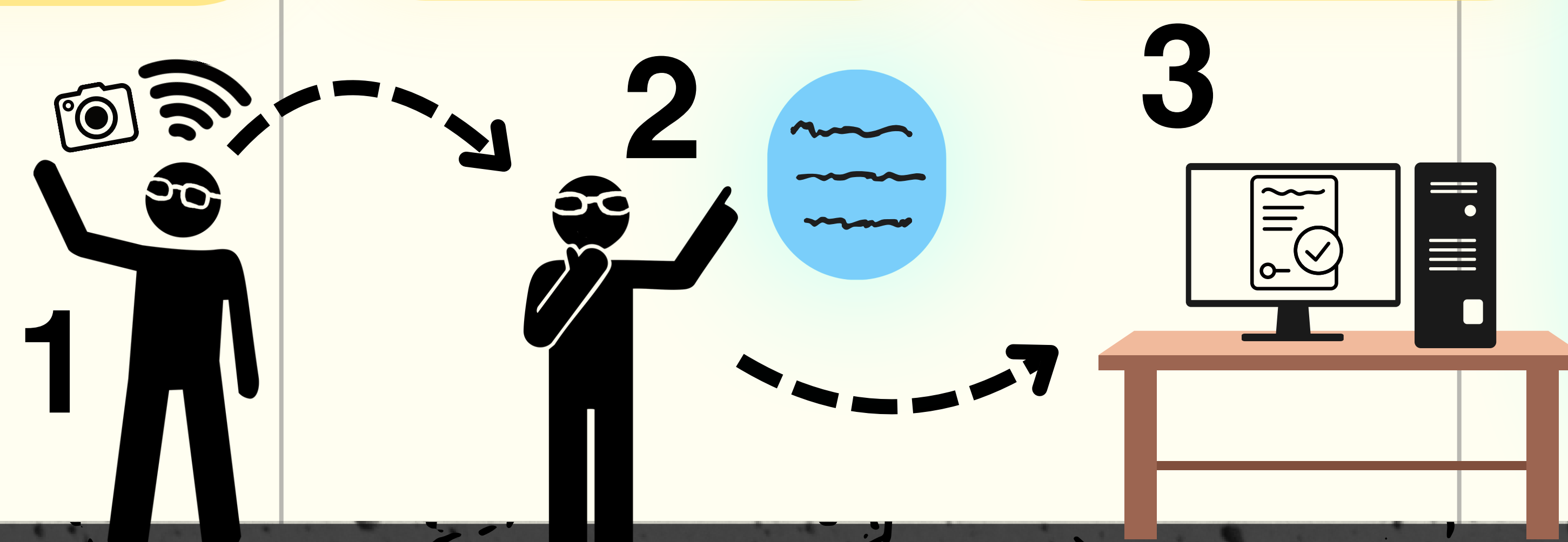
New standardized reporting method with photos
 Expanded use cases in MRO heavy checks, training applications, and data collection

Timeline



Concept of Operations:

- 1 The mechanic prompts WINGMAN vocally or visually
- 2 Relevant maintenance procedures and reports are provided
- 3 An automated log is generated from mechanic voice logs



Challenges

- A025 amendment approval
- Cybersecurity
- Weather conditions
- Initial learning curve

[1] J. Byungho, "A Compliance-Preserving Retrieval System for Aircraft MRO Task Search," arXiv preprint arXiv:2511.15383, Nov. 2025. [Online]. Available: <https://arxiv.org/abs/2511.15383>

[2] S. Tezcan and O. Kose, "Improving aircraft safety and reliability by aircraft maintenance technician training," Safety Science, vol. 95, pp. 46-54, Jun. 2017. [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S1350630716308834>

[3] D. Marx, "Learning from our Mistakes: A review of Maintenance Error Investigation and Analysis Systems (with recommendations to the FAA)," Galaxy Scientific Corporation, 1998. [Online]. Available: <https://libraryonline.erau.edu/online-full-text/human-factors-in-aviation-maintenance/other/LearningFromOurMistakes.pdf>

