



ICAO

# INTERNATIONAL CIVIL AVIATION ORGANIZATION

A UN SPECIALIZED AGENCY



# ICAO Survey on Moving from a Magnetic to a True North Reference System for Heading and Tracking in Aviation Operations

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Procedures Panel

AEEC

True North Navigation Symposium  
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# Introduction

## Background, objectives and methodology of the survey

### Background

- Canada presented a WP at AN-Conf/12 (Nov 2012) and AN-Conf/13 (Oct 2018) and an IP at the HLCC (Oct 2021), to discuss the topic of moving to a true north reference system in air operations.
- At IFPP/15 (March 2022), Canada also presented a WP to the Panel to consider a global switch to true north. The Panel supported the initiative but requested ICAO carry out a survey to investigate the level of support of States and industry for such a proposal.

### Objectives

- Determine the level of support of States and their aviation industry for ICAO to work on moving to true north.
- Identify any concerns or challenges that may need to be addressed for a transition to true north.
- The findings of the survey may be used to aid ICAO in developing any plans and strategies for true north.

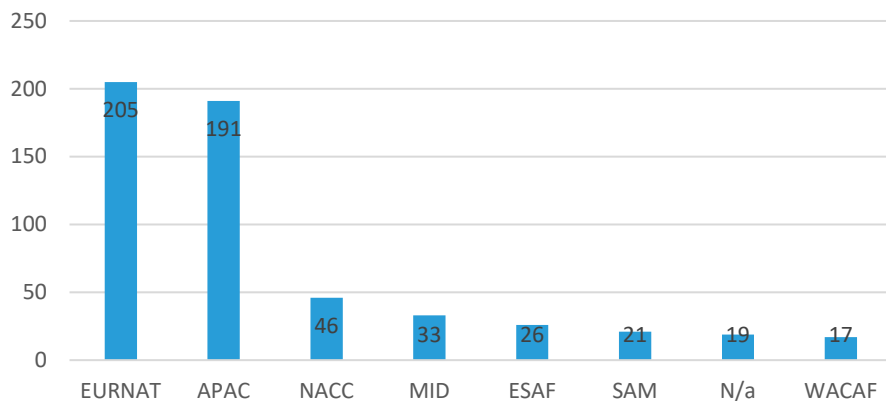
### Methodology

- The survey was conducted online using Microsoft Forms.
- 65 survey questions divided by stakeholders
- The survey link was sent by State Letter (SL AN11/57-22/87) on 21/9/2022.
- A link was provided in the SL to an ICAO website with supporting information related to the topic of true north.
- Two ICAO webinars were conducted to further inform States and industry of all considerations.

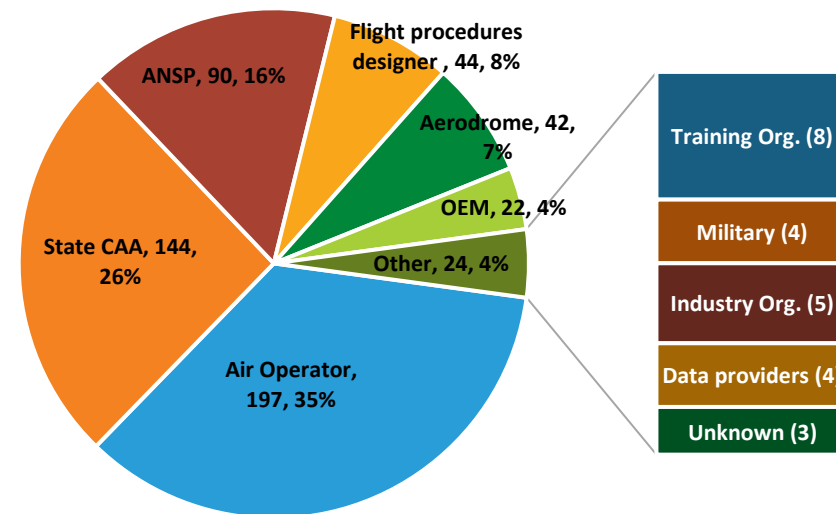
# Respondents

- 564 responses from 103 States during survey period (21/09/2022 – 31/12/2022)
- 37% of responses from EURNAT and 34% from APAC

*ICAO region of respondents*



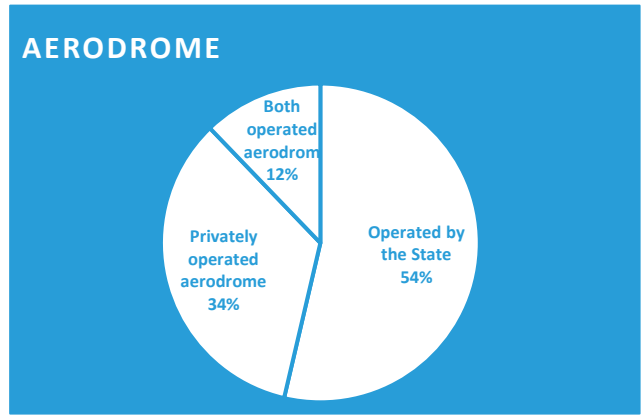
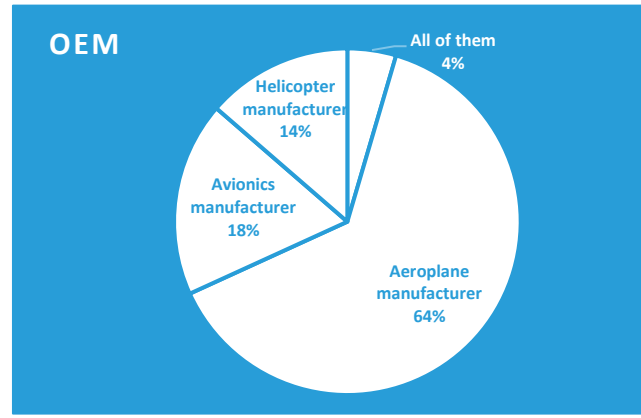
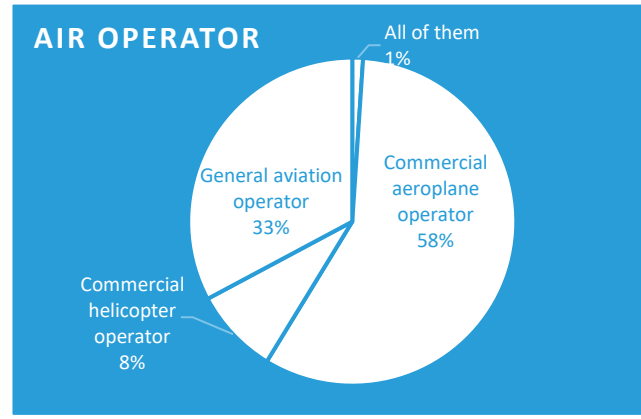
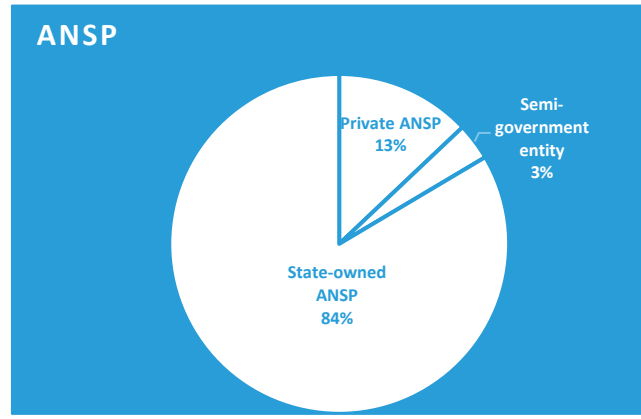
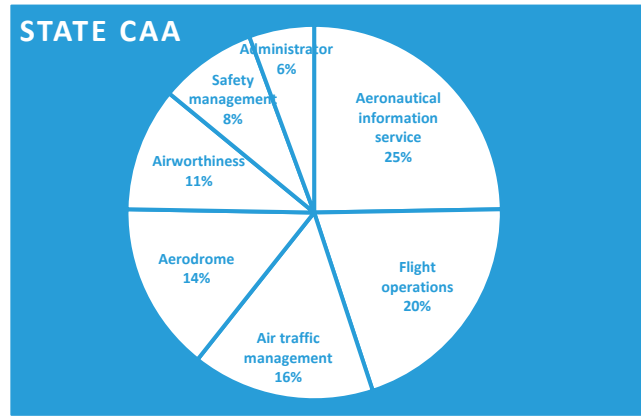
*Distribution of responses by stakeholders*



- Air operators, State CAAs and ANSPs accounted for 77% of respondents

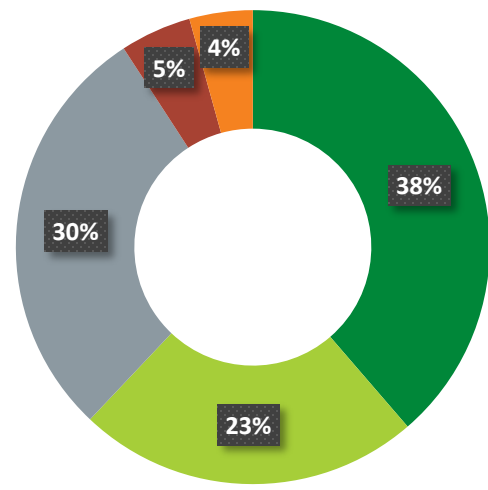
# Respondents

*Distribution within stakeholders*

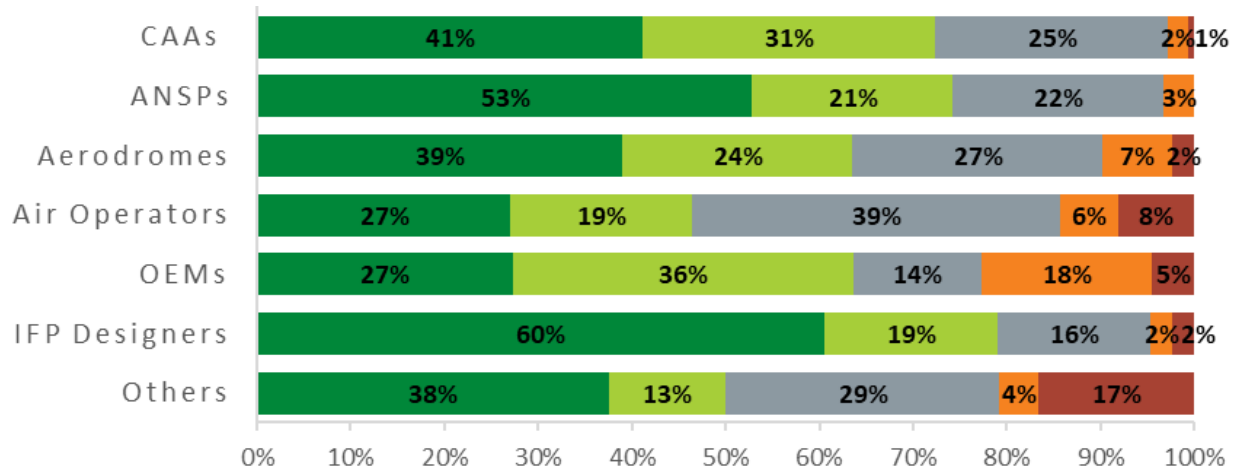


# Level of support for moving to true north

Overall support



Support by stakeholder



- Overall 61% support and 9% do not support

Strongly support   Somewhat support   Neutral  
Somewhat not support   Strongly not support

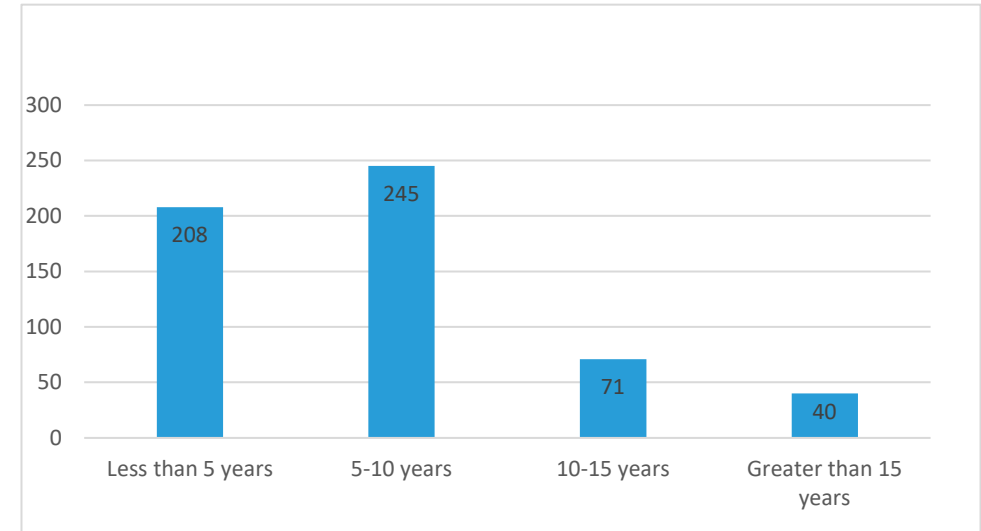
# Estimated timeframe to implement true north

- Majority of respondents indicated 10 years or less to implement true north with 81%
- OEM's were only outlier of overall trend with 32% indicating greater than 15 years

## Heat map of responses by stakeholders

Stakeholders	Less than 5 years	5-10 years	10-15 years	Greater than 15 years
Overall	37%	43%	13%	7%
State CAAs	36%	47%	13%	4%
ANSPs	48%	41%	8%	3%
Aerodrome	45%	38%	12%	5%
Air Operators	32%	43%	16%	9%
OEM	27%	27%	14%	32%
Flight procedures	42%	44%	11%	2%
Others	19%	54%	12%	15%

## Overall responses



## Air operator

### Recurring Activities to maintain MAGVAR

- Updating FMS 54%
- Annual Compass/AHRU alignment 51%
- Training personnel 41%
- Maintaining operating restrictions and ADs 27%
- Updating IRU MAGVAR tables 16%

## Air operator

### What activities will change with true north?

- Training personnel 69%
- Retrofit aircraft equipment 63%
- IRUs would need to enable the MAG/TRUE functions 44%
- Magnetically Slaved AHRS would have a one-time change 39%

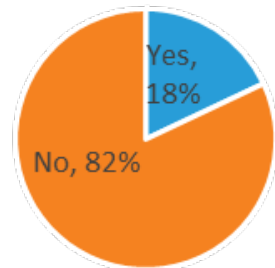


# Manufacturers

What activities will change with true north?

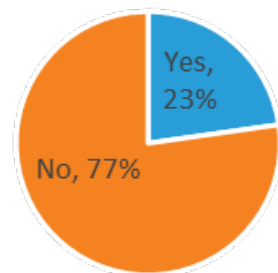
<input checked="" type="checkbox"/>	Redesign/upgrade equipment and certification	86%
<input checked="" type="checkbox"/>	Impact assessment of aircraft/equipment	32%
<input checked="" type="checkbox"/>	Amend manuals & publications	32%
<input checked="" type="checkbox"/>	Reduced airworthiness verification for MAGVAR	32%
<input checked="" type="checkbox"/>	Training personnel	9%
<input checked="" type="checkbox"/>	Coordinate with suppliers	9%

Already operate in Remote and Oceanic Airspace in True?



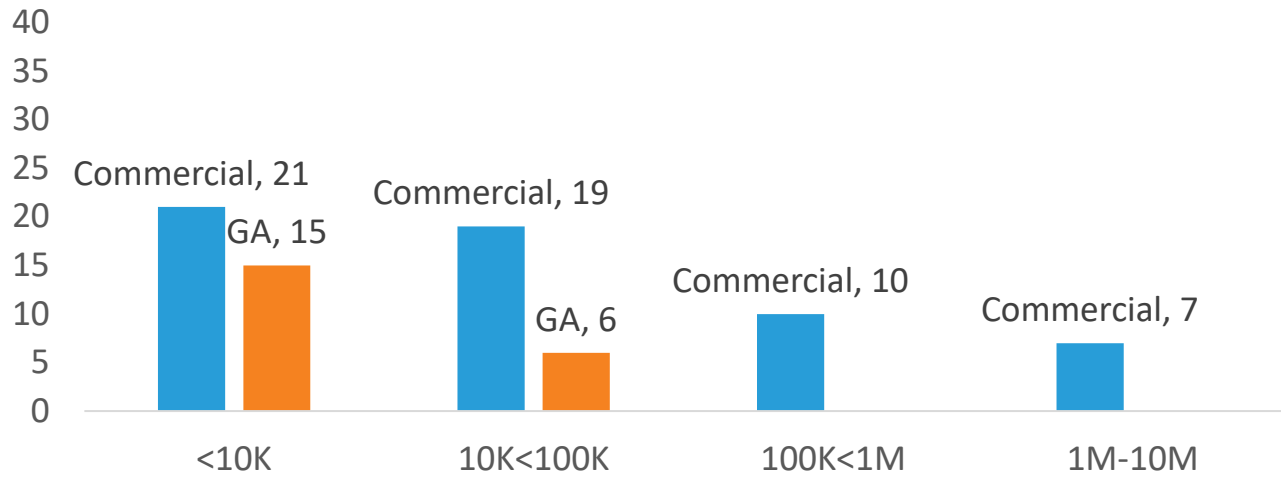
True north operations in remote and oceanic airspace – all air operators

Already operate in Polar areas in True?



# Costs to maintain MAGVAR – Air Operator

What is the approximate annual cost in U.S. Dollars to your organization to maintain the current Magnetic North EPOCH tables within the FMS/IRU?

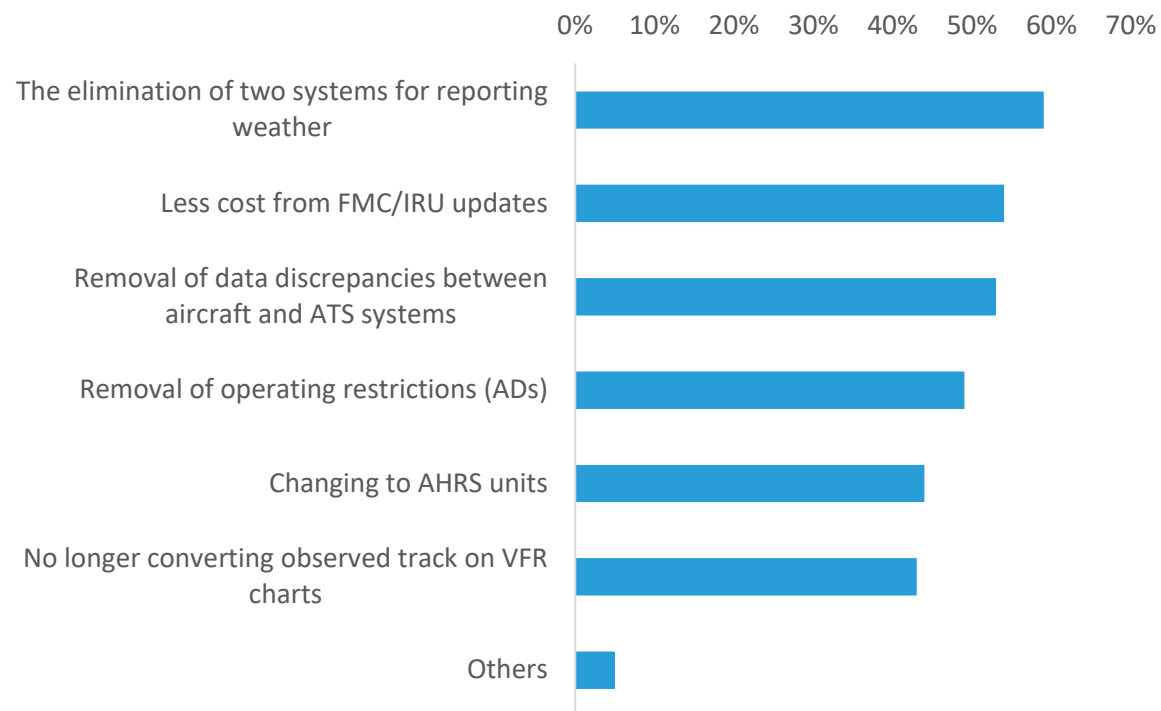


- Received useable cost data from approximately 40% of respondents
- Majority of responses for FMS/IRU updates for commercial operators was between 0-100K USD

## Examples FMS/IRU MAGVAR Updates Costs

	Fleet size	FMS/IRU cost over 10 years (\$USD)	Cost per aircraft (\$USD)
Large scale	900	\$40,300,000	\$47,305
	632	\$27,500,000	\$43,513
Middle scale	300	\$10,600,000	\$35,587
	200	\$8,000,000	\$40,000
Small scale	50	\$1,000,000	\$25,000
	10	\$4,000,000	\$40,000
<b>Average</b>			<b>\$38,567</b>

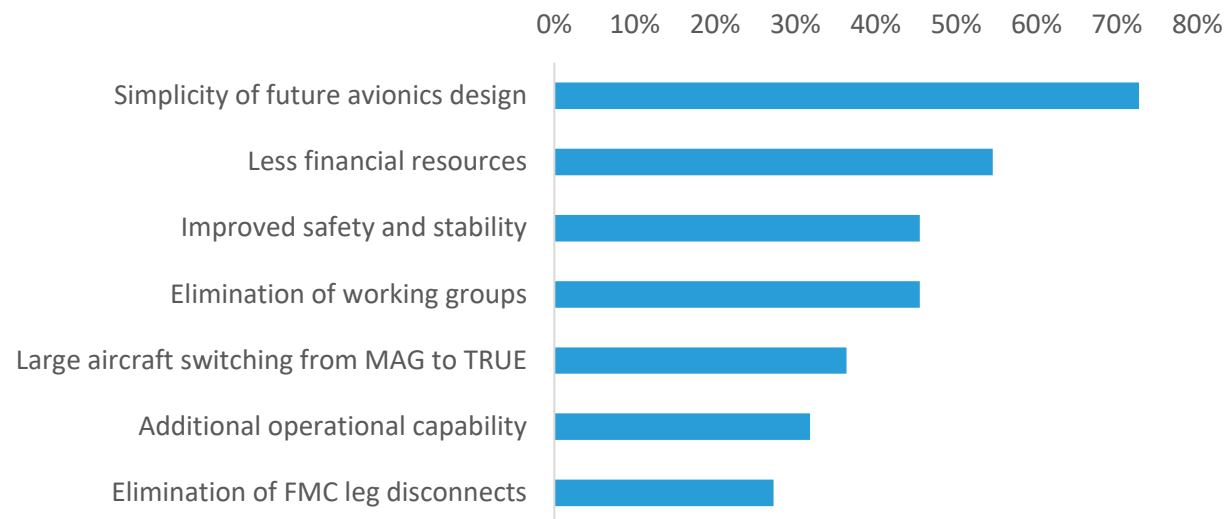
## Foreseen benefits – Air operators



### Other benefits mentioned:

- Reduced workload and more simplified operations
- Improved safety
- Long-term cost savings
- Makes use of today's advanced technology

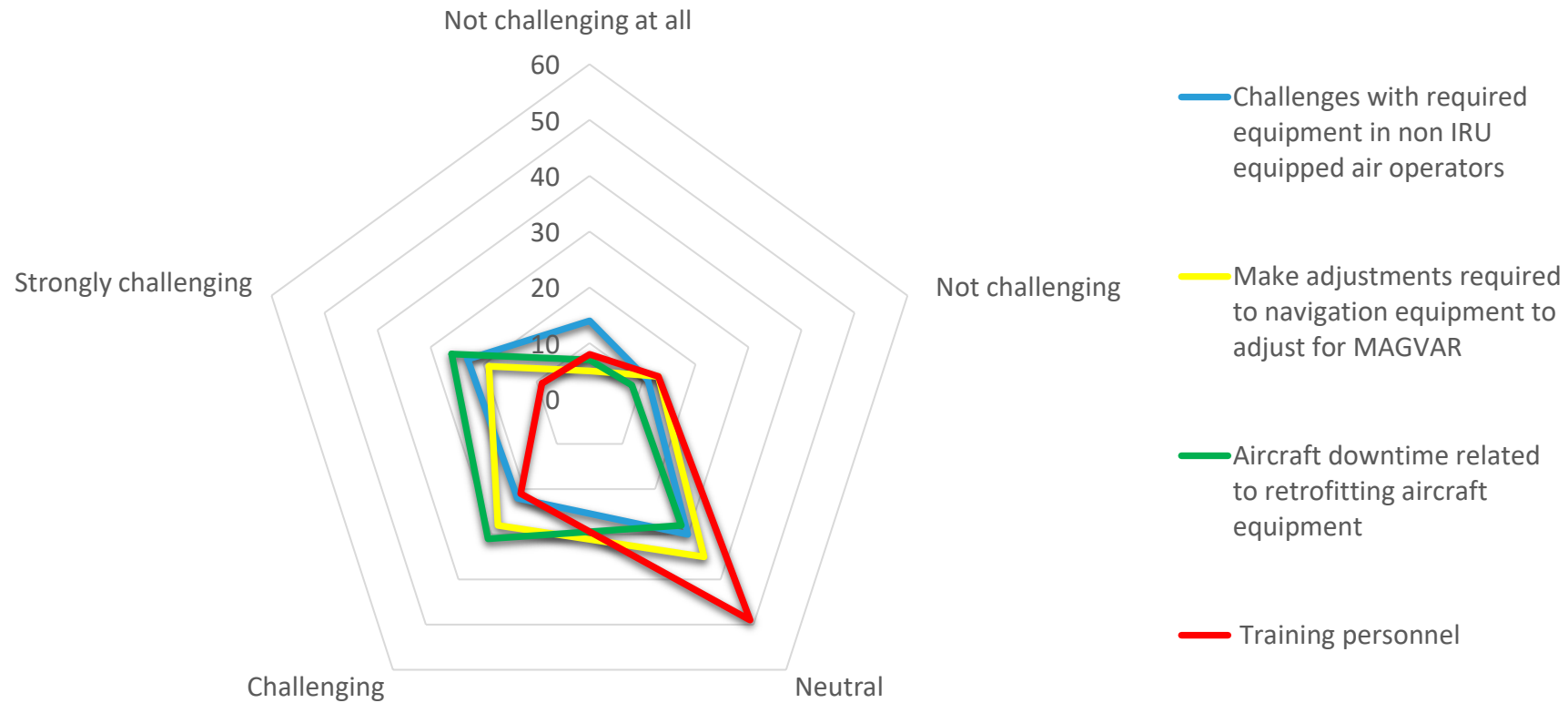
## Foreseen benefits – Manufacturers



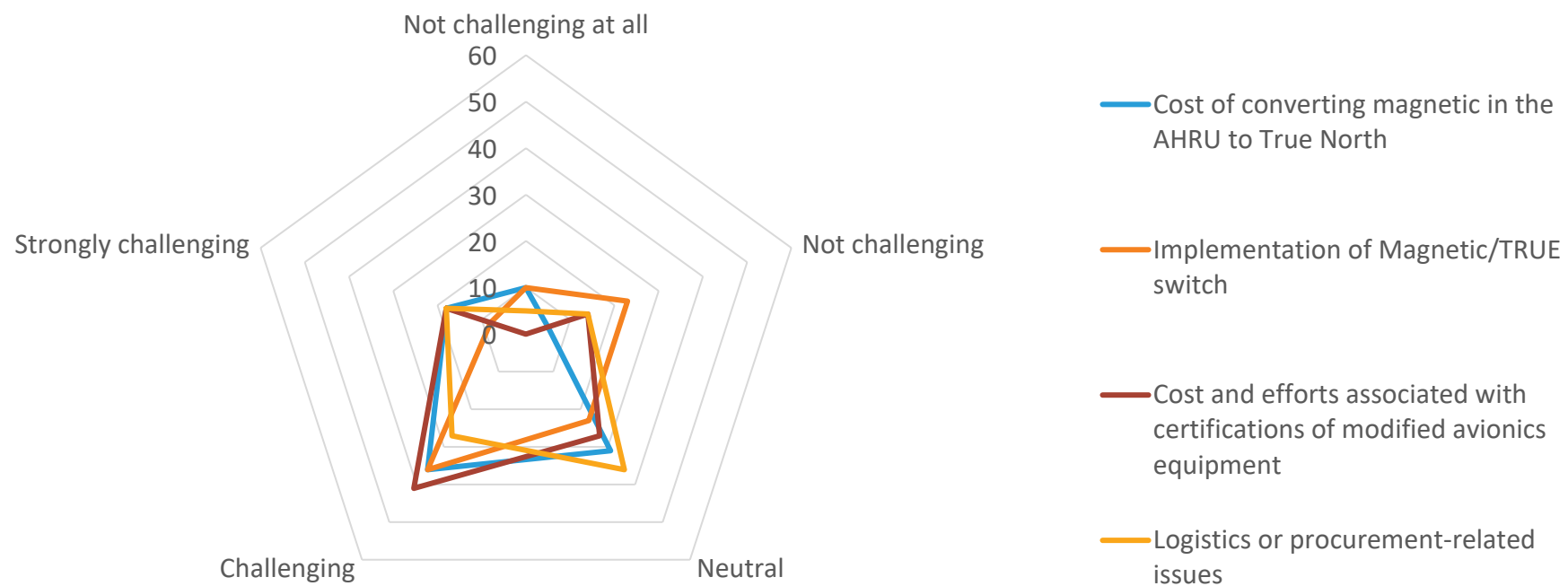
### Other benefits mentioned:

- Simplified operations and logic, particularly in areas of magnetic disturbance
- Eliminate the management of offsets in MAG/True reference NAV aids when switching from SDA to NDA regions
- Less limitations for operators to perform Cat II/III operations, who did not update Magvar databases in due time
- Less activity to identify operational limitations if Magvar not updated

# Potential challenges – Air operators



## Potential challenges – Manufacturers



— Cost of converting magnetic in the AHRU to True North

— Implementation of Magnetic/TRUE switch

— Cost and efforts associated with certifications of modified avionics equipment

— Logistics or procurement-related issues



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## Other identified challenges

### Air Operators

- Aircraft retrofit (downtime, parts logistics) (18)
- Training personnel (16)
- Need for a comprehensive transition plan supported by regulations & guidance (13)
- Insufficient one-time cost (9)
- General aviation related issues (9)
- Resistance to change / awareness promotion (7)

### Manufacturers

- Significant transition costs including integration of aircraft systems (10)
- Older and GA aircraft without IRU/INS (8)
- Safety concern of a mix system during transition (3)
- Harmonization across all related stakeholders (3)

## OEM navigation equipment unable to function in true north

3 OEM respondents answered they do produce AHRUs or other navigation equipment that is unable to function in true north:

**OEM 1:** *Three units currently produced are unable to function in True North. However, other equipment is impacted. Significantly, the Primary Flight Displays and Input/Output Concentrators, among others, would be impacted.*

**OEM 2:** *MEMS-based AHRS utilized in General Aviation, and most Business Aviation applications do not have the ability to gyrocompass or measure True North.*

**OEM 3:** *The vast majority of our aircraft can switch between magnetic and true north. However, some older model airplanes that may still be flying post-2030 may not readily function in True North.*

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## Key questions identified by the survey

- What timeframe will be needed to transition to true north globally?
- How will global acceptance and a harmonized transition be achieved?
- Should a transition to true north take a phased approach on a regional basis or be done concurrently across States and industry?
- What are the safety risks associated with a change to true north and how can they be identified and mitigated?
- What is the scope of impact, including equipment changes and operational changes, for general aviation and small aircraft operations?
- What will be the impact on large aircraft systems, equipment and operations?

## Summary

- Significant support for true north with 61% of respondents in support, 30% neutral and 9% not in support
- Top benefits include:
  - Long term cost savings
  - Improvements to aviation safety
  - Elimination of two systems for reporting weather
- Many implementation related challenges identified:
  - Need for a comprehensive transition plan and CONOPs
  - Harmonized transition and coordination with all relevant stakeholders
  - Resistance to change and awareness promotion
  - Potentially significant costs for equipping aircraft and integration of aircraft systems, particularly older and GA aircraft
- Inconclusive data on the cost benefit, may require further investigation



## Next steps

- Secretariat to brief Air Navigation Commission during 223 session – June 2023
- After ANC briefing the full survey report will be released
- Secretariat meeting with key organizations to better understand the issues
- Secretariat will propose next steps on True North to the ANC during the 224 session (Fall 2023), which may include forming of a study group to further study the topic and develop a CONOPs and Transition Plan





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Thank You!