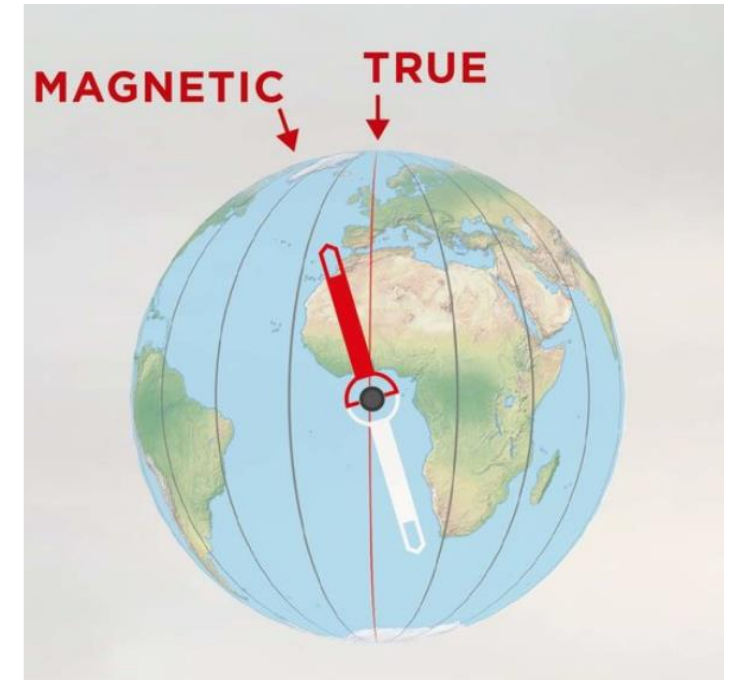




## Transitions Impact from Magnetic to True North (UAE Study Case)

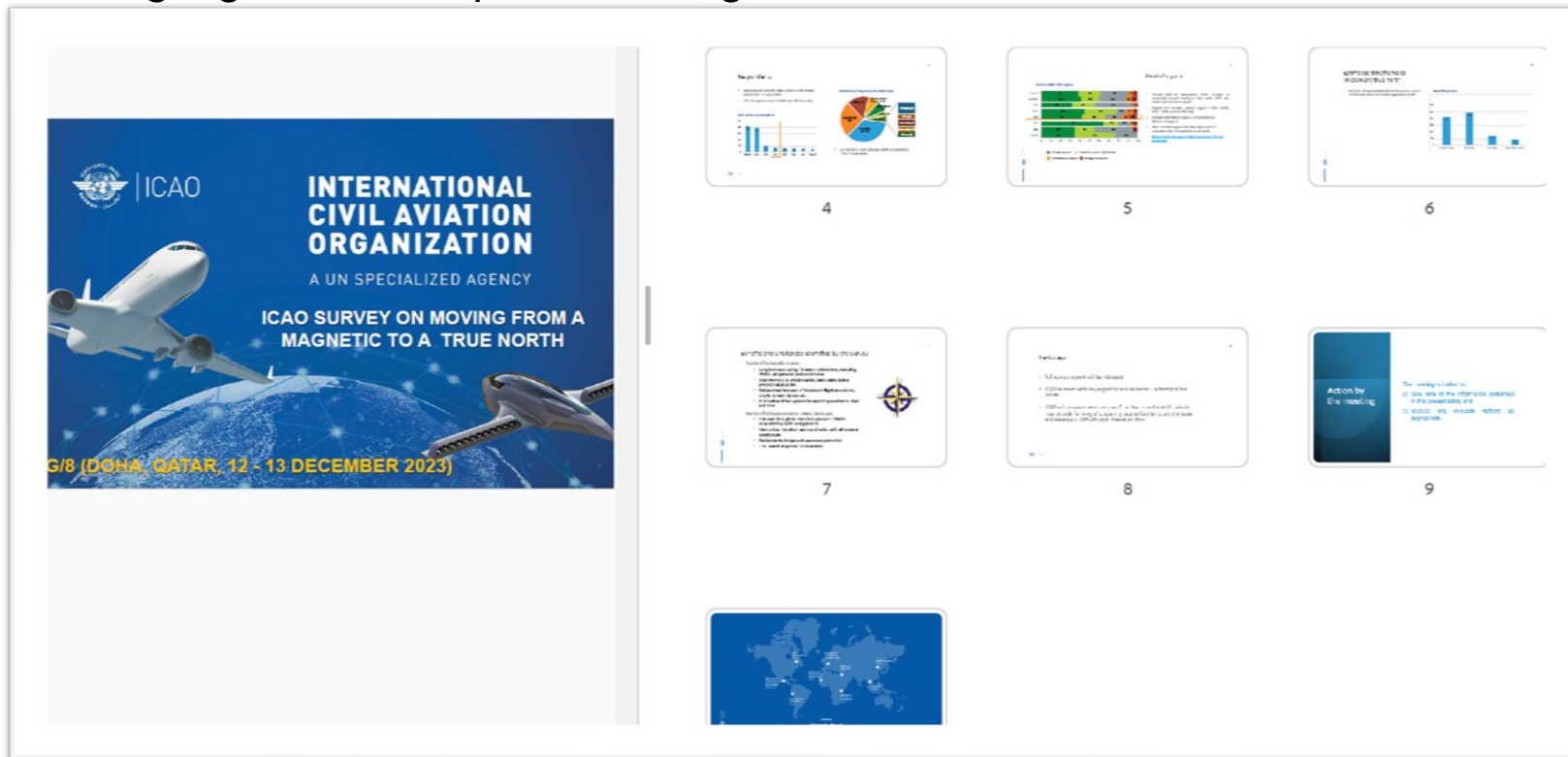
**Ninth Meeting of the Performance Based  
Navigation Sub-Group (PBN SG/9)  
(Doha, Qatar, 9 - 11 December 2024)**



## PBN SG/8 Working Paper Overview (Doha, 12-13 Dec)

### ICAO Survey on Moving from Magnetic to True North

- ICAO conducted a survey to assess the transition's impact on air operations.
- Feedback gathered from states covered technical, operational, and cost impacts.
- The conclusion highlighted the importance of global collaboration for a successful transition.





## Related Working Papers

- Canada presented papers to the ANC detailing the change to switch to a True North Reference system in aviation
  - AN Conf/12 WP/147
    - Para 6.5.25: ICAO invited interested states to study the technical, operational, and economic impacts, as well as the costs and benefits.
  - AN Conf/13 WP/114
    - Para 3.44: ICAO should explore the costs and feasibility of adopting True North.
    - *Recommendation 3.5/4*: Conduct a detailed study on the technical, operational, and economic feasibility.

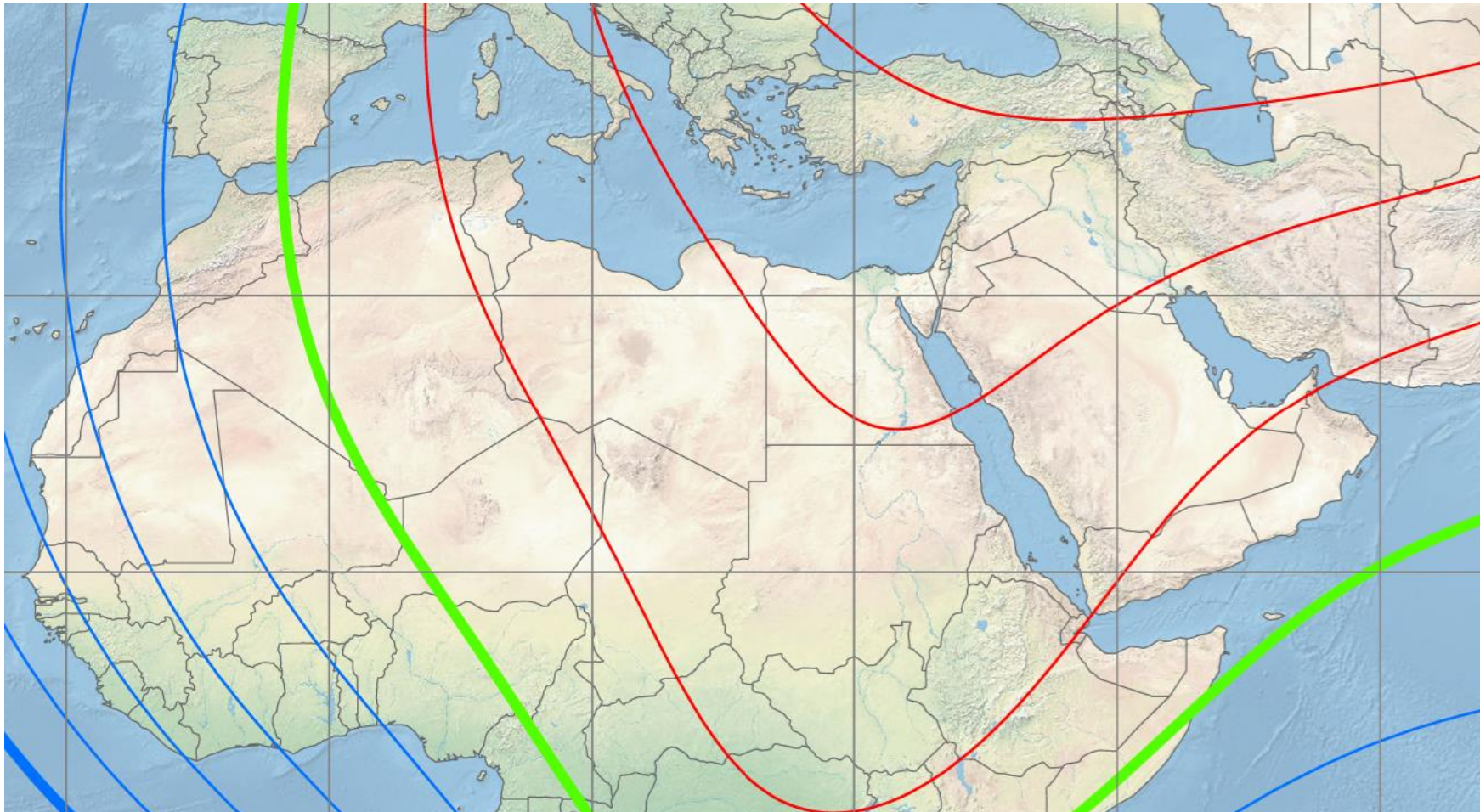


## ICAO State Letter – Expert Nominations (3 January 2024)

- ICAO Request for Expert Nominations (Ref.: AN 11/65-IND/24/1)
  - At the seventh meeting of its 224th Session, held on 7 November 2023, supported the establishment of the True North Advisory Group (TRUE-AG)
    - ICAO invited states and organizations to nominate experts for TRUE-AG.
    - Participating Countries & Organizations:
      - Australia, KSA, USA, UAE, Incorporated (ARINC), (CANSO), (EASA), (EUROCONTROL), (GAMA), (IAIN), (IAOPA), (IATA), (IBAC), (ICASC), (ICCAIA), International Federation of Air Line Pilots' Associations (IFALPA), (IFATCA) and others.
    - Task: Develop CONOPS, analyse impacts, and conduct studies on costs, benefits, and safety.

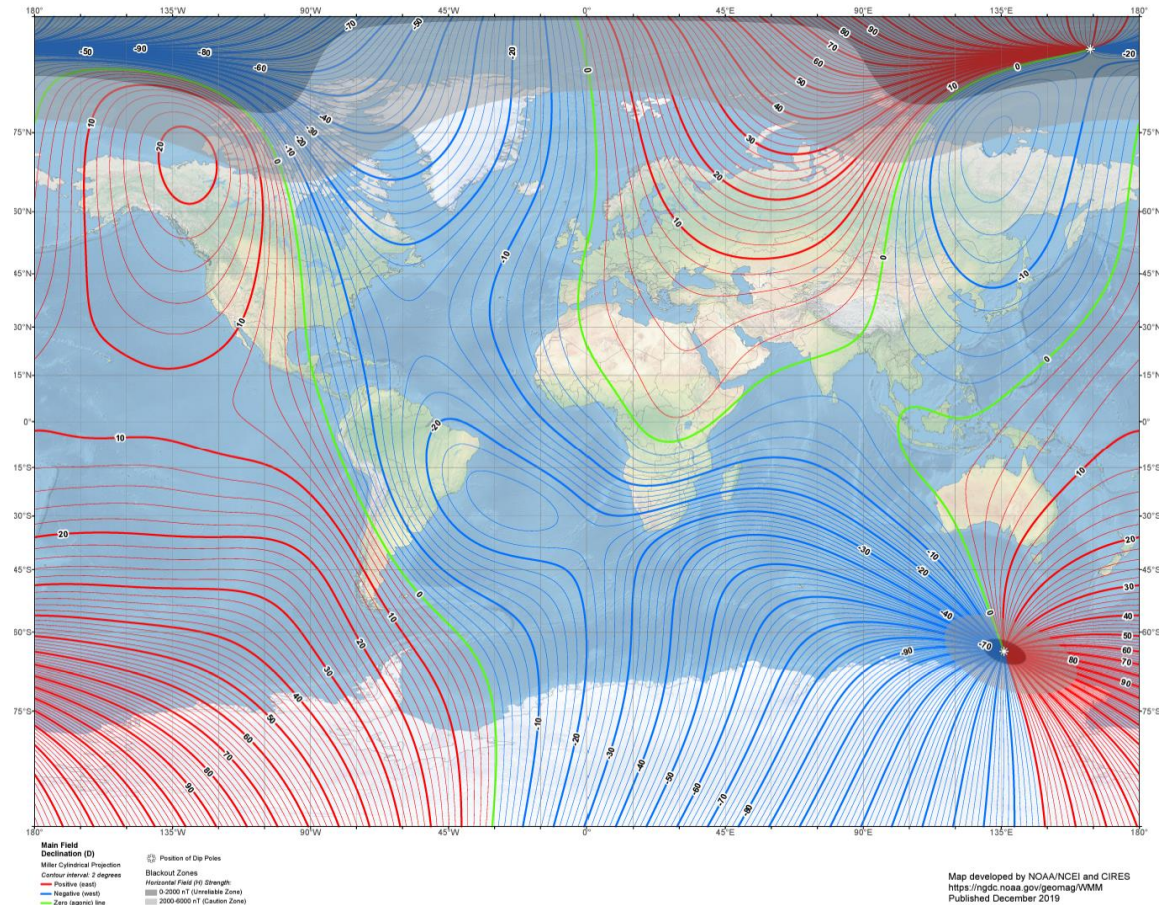


## Magnetic Field (MID Region)



## Magnetic Field Declination

- Earth's magnetic north pole is currently moving towards Siberia
- This movement has been ongoing for over a century, with the pole drifting in a relatively linear path from Canada towards the geographic North Pole and beyond
- The movement is driven by fluid dynamics in the Earth's liquid outer core, which generates the magnetic field





## Tasks and Required Expertise for TRUE-AG

### ➤ Tasks:

- Develop CONOPS for True North implementation.
- Conduct studies on impact (cost-benefit analysis, safety, and SWOT).
- Provide ICAO with the way forward (road map) for True North

### ➤ Required Expertise:

- ANSPs, Regulators, Avionics Experts, Air Traffic Control (ATC), Procedure Designers, etc.



## Affect on the Industry

### ➤ Navigation

- Huge documentation change (Airspace Management Vs AIM)
- Thresholds denomination could be changed (i.e. OMAA in the UAE)

### ➤ Calibration Systems:

- ILS/DME → Not required since the LOC is adjusted to RWY axis with the azimuth corresponding to the APCH RWY
- VOR/DVOR → Adjusted to Magnetic North in accordance with ICAO Annex 10
- VOR indicates magnetic radials, & that would have to be changed to “True” radials



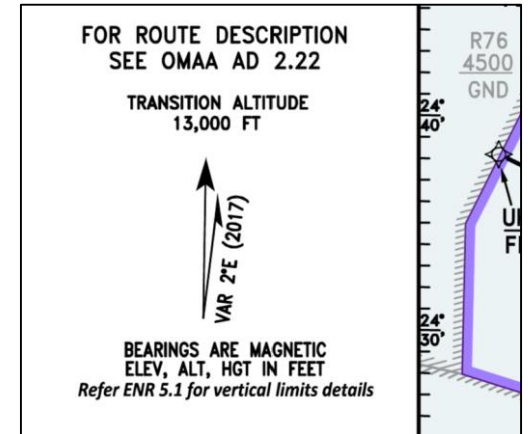
## Affect on the Industry

### ➤ AIM

- MAG/VAR tables are updated every 5 years, and it takes at least 3 years to be fully realised
- The switch to True North would reduce workload and limit publishing errors

### ➤ ATC:

- ATM system has MAG/VAR tables coded within it's code and does the conversion. Moving to True North would require an upgrade (cost)
- The move would entail training for ATC staff which shall be basic due to the low magnetic declination in the UAE





## Affect on the Industry

### ➤ IFPD

- ICAO requires procedures to be published with magnetic bearings
- Our IFPD software is capable of doing both and provides values in True & Magnetic
- IFPD software & AIM systems are not integrated, therefore same working methodology will continue

### ➤ Military:

- Unaware of their systems, avionics and conversion abilities
- No feedback received, however whatever military complies with civil rules when flying in civilian airspace



## Affect on the Industry

### ➤ Airspace Users

- One major airline in the UAE advised that their Airbus fleet is capable of doing flying and presenting True North as of today.
- However, their Boeing fleet would require an upgrade.





| Subject                                     | Components/Systems:  |
|---|--|
| All Aeronautical Data published by a state: | Charts (IFP, ENR Charts)<br>Navigation Data (Tabular Description)<br>AIP (ENR Data, AD Data)<br>Data Exchange (AIXM)<br>Publication systems<br>IFP Design<br>Data Origination  |
| Third party data providers:                 | Production Systems<br>Processing Standards (ARINC, RTCA, EUROCAE)<br>Charts<br>NavData<br>AMM/AMDB<br>Obstacles/Terrain<br>3rd party Procedure Design<br>UAS   |
| Flight Planning Systems:                    | FP Processing and distribution systems (state, regional, etc.)<br>Flow management systems<br>Data exchange (i.e. FIXM, FF-ICE)/Creation, conformance<br>3rd party FP service providers   |
| Surveillance Systems:                       | Ground Based (RADAR, ADS-B, MLAT, ASDE, SMR)<br>Space Based (ADS-B, ADS-C, GADSS, ADT)   |
| Navigation Systems:                         | Ground Based (VOR, DME, TACAN, NDB, VDF, ILS)<br>Space Based<br>Management System  |
| Communication Systems:                      | VHF, SATCOM, CPDLC, UHF  |
| Weather systems:                            | Weather/MET Sensing and Display (Video Mapping)  |
| ATM/UTM System:                             | ATS/ATC Procedures (Separation, etc.)<br>Chart Video Mapping<br>Surveillance data processing<br>Flow and capacity tools<br>ATS/ATCO displays (targets, target tools, maps, overlays, display orientation)<br>ATS (ATCO, ATC and ATS Specialists) Personnel |

| A                               | B  | C   | D   | E   | F  |  |
|---------------------------------|--|---|---|---|--|--|
| Subject                         | Components/Systems:  | System Change/Impact  | Operational Change/Impact   | Training Change/Impact/Requirement  | Additional Considerations  |  |
| All Aeronautical Data published | Charts (IFP, ENR Charts)   | System Change: International Civil Aviation Organization (ICAO) Annex 4, 5, 6, 10, 11, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 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| Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new chart data and procedures. This may include ground school, simulator, and line training.                                 | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
|                                 | Navigation Data (Tabular Description)  | System Change: Updates to navigation data, including changes to waypoints, routes, and procedures. This may require updates to flight manuals and pilot training.   | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new navigation data and procedures. This may include ground school, simulator, and line training.                            | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
|                                 | AIP (ENR Data, AD Data)  | System Change: Updates to the Aeronautical Information Publication (AIP), including changes to the En Route (ENR) and Airport (AD) sections. This may require updates to flight manuals and pilot training.   | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new AIP data and procedures. This may include ground school, simulator, and line training.                                   | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
|                                 | Data Exchange (AIXM)   | System Change: Updates to the Aeronautical Information Exchange Model (AIXM), including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training.  | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new AIXM data and procedures. This may include ground school, simulator, and line training.                                  | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
|                                 | Publication systems  | System Change: Updates to the systems used to publish aeronautical data, including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training.   | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new publication system data and procedures. This may include ground school, simulator, and line training.                    | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
|                                 | IFP Design   | System Change: Updates to the International Flight Procedure (IFP) design, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.   | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new IFP design data and procedures. This may include ground school, simulator, and line training.                            | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
|                                 | Data Origination   | System Change: Updates to the systems used to originate aeronautical data, including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training.   | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new data origination data and procedures. This may include ground school, simulator, and line training.                      | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
|                                 | Third party data providers:  | Production Systems  | System Change: Updates to the systems used to produce aeronautical data, including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training.   | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.               | Training Change: Updates to pilot training programs to reflect new production system data and procedures. This may include ground school, simulator, and line training.              | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |
|                                 |  | Processing Standards (ARINC, RTCA, EUROCAE) Charts  | System Change: Updates to the standards used to process aeronautical data, including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training. | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.               | Training Change: Updates to pilot training programs to reflect new processing standards data and procedures. This may include ground school, simulator, and line training.           | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |
|                                 |  | NavData   | System Change: Updates to the navigation data, including changes to waypoints, routes, and procedures. This may require updates to flight manuals and pilot training.                               | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.               | Training Change: Updates to pilot training programs to reflect new NavData data and procedures. This may include ground school, simulator, and line training.                        | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |
| AMM/AMDB                        |  | System Change: Updates to the Aircraft Maintenance Manual (AMM) and Aircraft Maintenance Database (AMDB), including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training.  | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new AMM/AMDB data and procedures. This may include ground school, simulator, and line training.                              | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
| Obstacles/Terrain               |  | System Change: Updates to the obstacle and terrain data, including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training.   | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new obstacle/terrain data and procedures. This may include ground school, simulator, and line training.                      | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
| 3rd party Procedure Design      |  | System Change: Updates to the systems used to design third-party flight procedures, including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training.  | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new third-party procedure design data and procedures. This may include ground school, simulator, and line training.          | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
| Flight Planning                 | UAS  | System Change: Updates to the systems used to manage Unmanned Aircraft Systems (UAS), including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training.  | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new UAS data and procedures. This may include ground school, simulator, and line training.                                   | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
|                                 | FP Processing and distribution systems (state, regional, etc.)                 | System Change: Updates to the systems used to process and distribute flight planning data, including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training.   | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new FP processing and distribution system data and procedures. This may include ground school, simulator, and line training. | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
|                                 | Flow management systems  | System Change: Updates to the systems used to manage flight flow, including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training.  | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new flow management system data and procedures. This may include ground school, simulator, and line training.                | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |
|                                 | ATS/ATCO displays (targets, target tools, maps, overlays, display orientation) | System Change: Updates to the systems used to display aeronautical data, including changes to data formats and exchange protocols. This may require updates to flight manuals and pilot training.   | Operational Change: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training.                       | Training Change: Updates to pilot training programs to reflect new ATS/ATCO display data and procedures. This may include ground school, simulator, and line training.                      | Additional Considerations: Impact on flight operations, including changes to flight paths, altitudes, and procedures. This may require updates to flight manuals and pilot training. |  |



## Summary

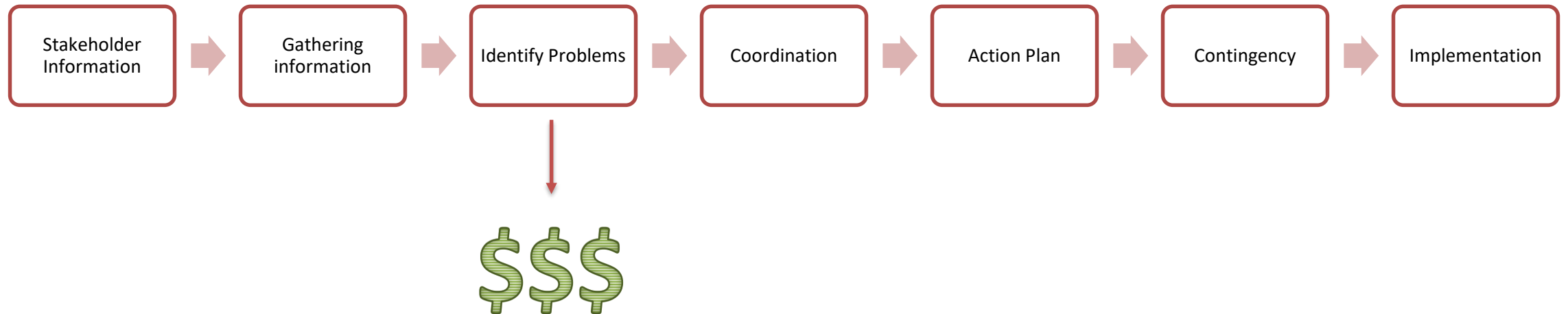
- True North transition in the UAE is expected to be straightforward as the effect is almost negligible (+2 E)
- National & Regional action plans would be required
- Due to different technicalities we might see a world of co-existing navigation (True & Magnetic) until the world is fully transitioned
- Due date for the plan/advise to ICAO is 2030



## Summary

➤ Coordination is required between:

➤ Regulators, ATC, FPD, AIM, CNS, Military, Airlines, General Aviation, OEMs



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GENERAL CIVIL AVIATION AUTHORITY



# Thank You