



ANZSASI 2016 REGIONAL AIR SAFETY INVESTIGATION SEMINAR

PREPARING FOR A GLOBAL AERONAUTICAL DISTRESS AND SAFETY (GADSS) SYSTEM

31 May 2016

SKYTRAC ²/₁
GREATER VISION
BETTER DECISIONS

FULL AND OPEN DISCLOSURE

- This is not an ICAO briefing
 - Sources: ICAO documentation, GADSS meetings, secondary sources, corporate experience
 - Facts, interpretations, technical biases
 - There remain grey areas in interpretation and regulations
 - ICAO References:
 - ICAO GADSS Homepage:
<http://www.icao.int/safety/globaltracking/Pages/Homepage.aspx>
 - ICAO GADSS CONOPS:
http://www.icao.int/Meetings/HLSC2015/Documents/WP/wp002_en.pdf

OVERVIEW

- Background
- Components and Timelines
- Technology Options and Implementation Considerations
- Summary
- Take Away

BACKGROUND

GADSS BACKGROUND



World focus

Low probability-High impact events

ICAO: *“One of the many reasons why aviation maintains a high level of safety is the willingness to learn **important lessons from rare events**”*

Key: our global will to embrace comprehensive GADSS goals

GADSS BACKGROUND

- **May 2014:** ICAO Special Multidisciplinary meeting on global flight tracking (MMGFT)
 - Ad Hoc Working Group – (AHCW) established
 - CONOPS – objectives, roles/responsibilities of all stakeholders
 - Aircraft Tracking Task Force (ATTF) established
- **Feb 2015:** High-Level Safety Conference Feb 2015
 - Normal Aircraft Tracking Implementation Initiative (NATII)

Information Gathering

GADSS BACKGROUND

- **10 November 2015**: ICAO Council adopted **Amendment 39** to Annex 6 (Operation of Aircraft, Part I, International Commercial Air Transport — Aeroplanes)
 - Normal aircraft tracking Standards and Recommended Practices (SARPs)
 - SARPs applicable Nov 2018
 - Establish operator's **responsibility to track** its aircraft throughout its area of operations
 - 4D position report every **15 mins** for aircraft with seating capacity greater than 19
 - Recommendation to all operations of aircraft with a take-off mass of 27 000 kg and as a requirement to all operations of aircraft with a take-off mass of 45 500 kg when flying over oceanic areas
 - Establish the requirement for **data retention** to assist SAR in determining last known position of aircraft
 - Establish when an air operator needs to report missing aircraft position information.

SARP Output

Reference: <http://www.icao.int/safety/globaltracking/Pages/GADSS-Update.aspx>

GADSS BACKGROUND

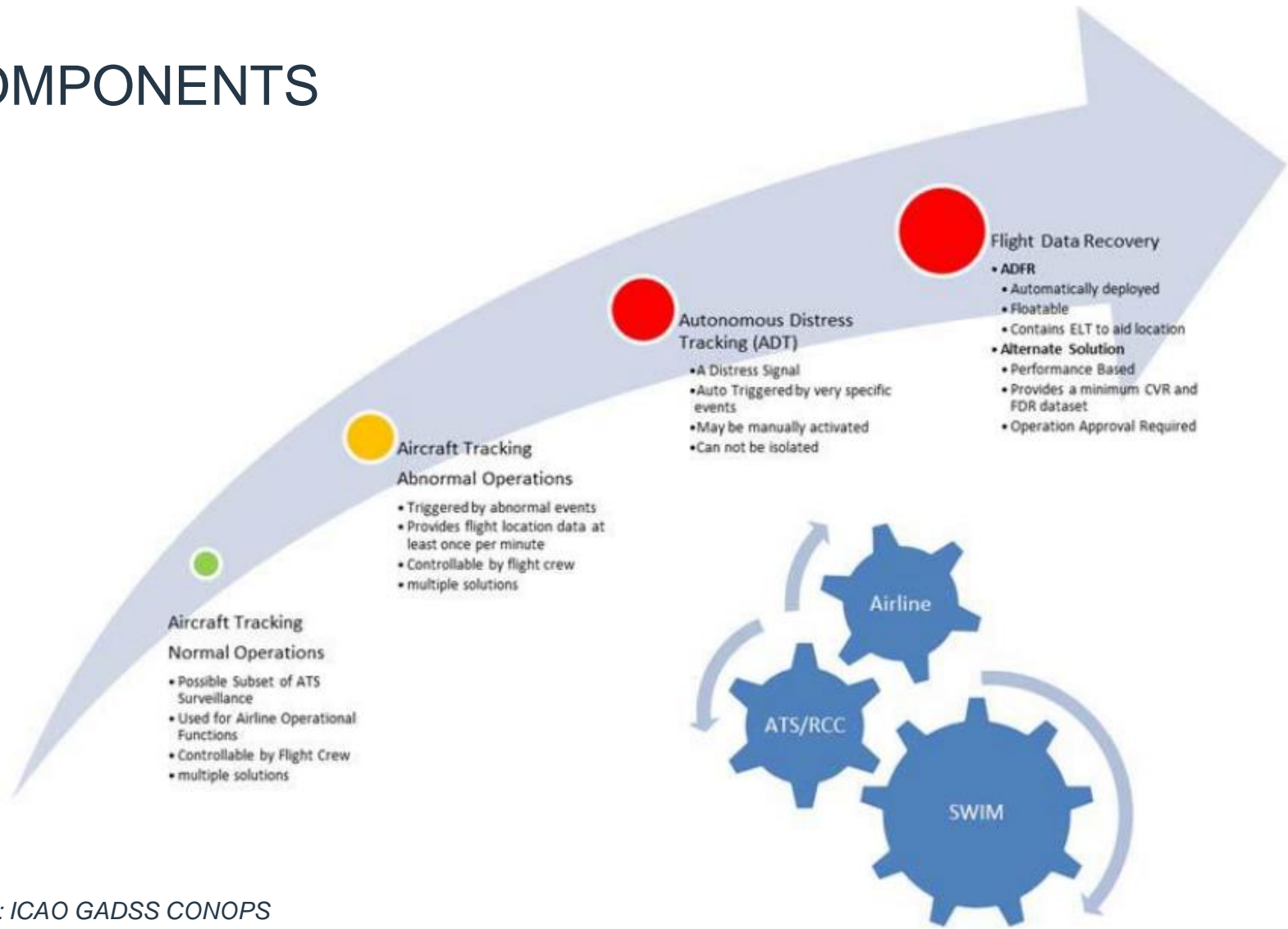
- **2 March 2016**: ICAO Council adopted **Amendment 40** to Annex 6
 - SARPs addressing GADSS autonomous distress tracking (ADT)
 - SARPs applicable 1 Jan 2021
 - ADT=1x 4D position report **every minute**
 - Applicable to new aircraft with take-off mass >27 000 kg; also recommends that it applies to new aircraft with take-off mass >5 700 kg
 - Locating an accident site to within **6 NM** radius
 - **Independent of electrical power**
 - Not technology-specific, will allow for various solutions, including a **triggered** transmission system (tamper proof)
 - Establishes requirements for **sharing** information available to SAR, RCC's and ATC
 - Apply only to newly manufactured aircraft, there is an incentive to retrofit aircraft (ELT)

SARP Output

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COMPONENTS AND TIMELINES

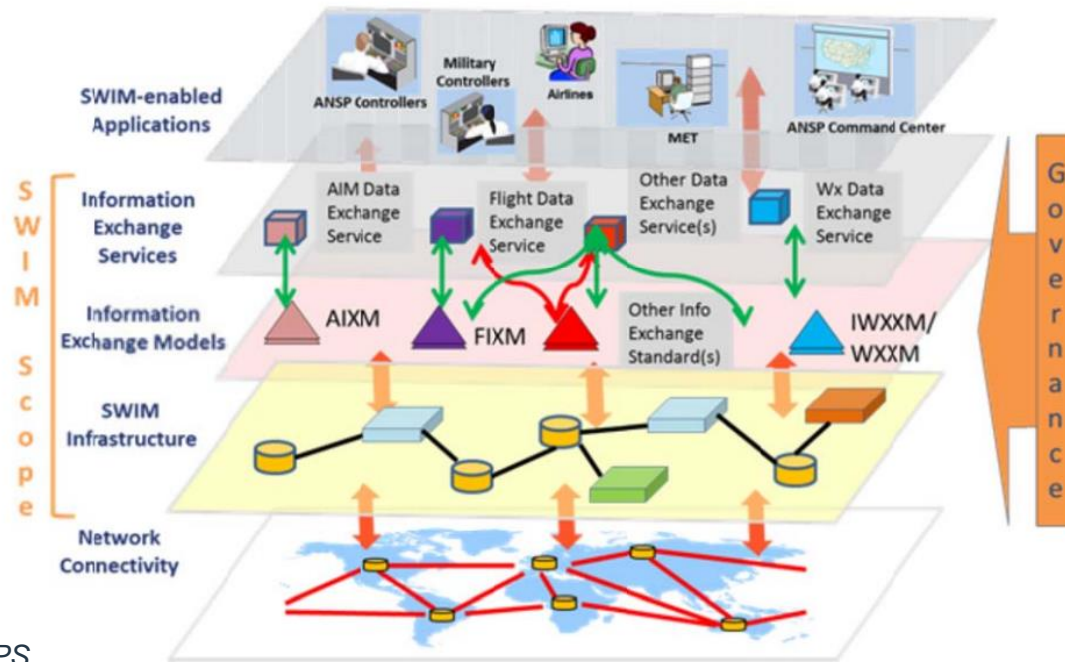
COMPONENTS



Reference: ICAO GADSS CONOPS

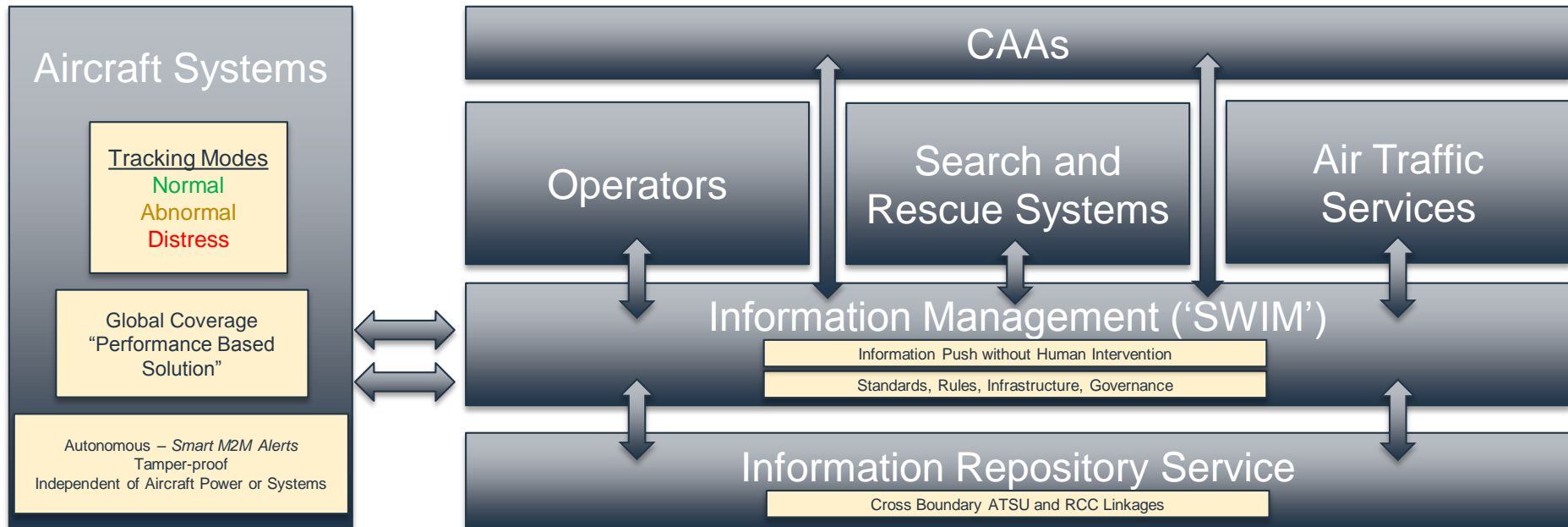
COMPONENTS

- System Wide Information Management (SWIM)
 - Data supplied by aircraft tracking, ADT and flight recorder must be **effectively shared** among all stakeholders as necessary to ensure the effective GADSS operation
 - Consists of **standards, infrastructure and governance** enabling the management of ATM related information and its exchange between qualified parties via interoperable services



Reference: ICAO GADSS CONOPS

COMPONENTS



TIMELINES

NORMAL TRACKING

- March 2016, Effective
- November 2018, Applicable

ABNORMAL
TRACKING?



DISTRESS TRACKING

- July 2016, Effective
- January 2021, Applicable

NORMAL TRACKING

- December 2018
- *After 2021 ping rate = 3 mins unless equipped with ADT

DISTRESS TRACKING

- January 2021
- *Accuracy increases to 3nm after 2023
- *Low Frequency-Underwater Location Devices (FL-ULD): not required if equipped with ADT

Singapore: 15 minute tracking by 1 July 2016 over all airspace; 8 Nov 2018 only automated tracking will be allowed

Other CAAs TBD

ICAO

EASA

CAAs

TECHNOLOGY OPTIONS AND IMPLEMENTATION CONSIDERATIONS

TECHNOLOGY OPTIONS

Technology Option	Tracking	6nm Radius of Accident Site	Search and Rescue Alerting	Preliminary Accident Investigation	Current Providers	Remarks
ACARS to Airlines (via SATCOM)	Yes	No, at 15 Min reporting interval as offered by ACARS	Not directly	Limited.	Several, ARINC, SITA, etc.	Currently on aircraft. Would require 1 min reporting intervals to meet 6 nm radius of accident site
ADS-C to ATC (periodic reporting)	Yes	Not typical, but possible if sent at 1 minute intervals	Not directly	No	ARINC or SITA	Currently on aircraft. Would require 1 min reporting intervals to meet 6 nm radius of accident site
ADS-B Out (satellite-based reception)	Yes	Yes	Not directly	Yes, current ADS-B parameter could support some reconstruction	Aireon (Iridium, Nav Canada), GlobalStar ALAS	ADS-B required in 2020. GlobalStar system currently in certification. Iridium subscription service planned to start 2018
Deployable Recorder (CVR/FDR/ELT)	Yes, but only after an accident	Yes, via ELT alerting, on impact with ground/water	Yes via COSPAS SARSAT system	Yes, once recovered	DRS Technologies, Cassidian, Hr Smith	Independently powered, and deployment is not dependent on flight crew action.
Current 406 MHz ELT	Yes, but only after an accident	Maybe, not as dependably using Doppler processing	Yes via COSPAS SARSAT system	No, position and aircraft registration information only	Several	Has proven ineffective on large, commercial transport aircraft.
2nd Generation 406 MHz ELT with "Events" Driven ability (In Development)	Yes, improved satellite constellation constant coverage and positioning techniques	Yes, improved satellite constellation constant coverage and positioning techniques	Yes via COSPAS SARSAT system	No, position and aircraft registration information only at this time	Standards currently being worked in RTCA SC-229 and Eurocae WG-98	Would require tamper proof aircraft triggering logic. ELT has independent battery and is installed in inaccessible location.
Commercial GPS Tracking Solutions	Yes	Depending on the update rate	Not directly	Basic track, speed, altitude and forces derived from GPS data	Spidertracks, Guardian, Bluesky, DTS Services, SkyTrac, etc.	Would require tamper proof location and electrical power

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March 9th, 2016

MRO & Flight Ops IT Conference



Federal Aviation Administration

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TECHNOLOGY OPTIONS (SKYTRAC comments)

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YES- Triggered 1-3 second 'pings'

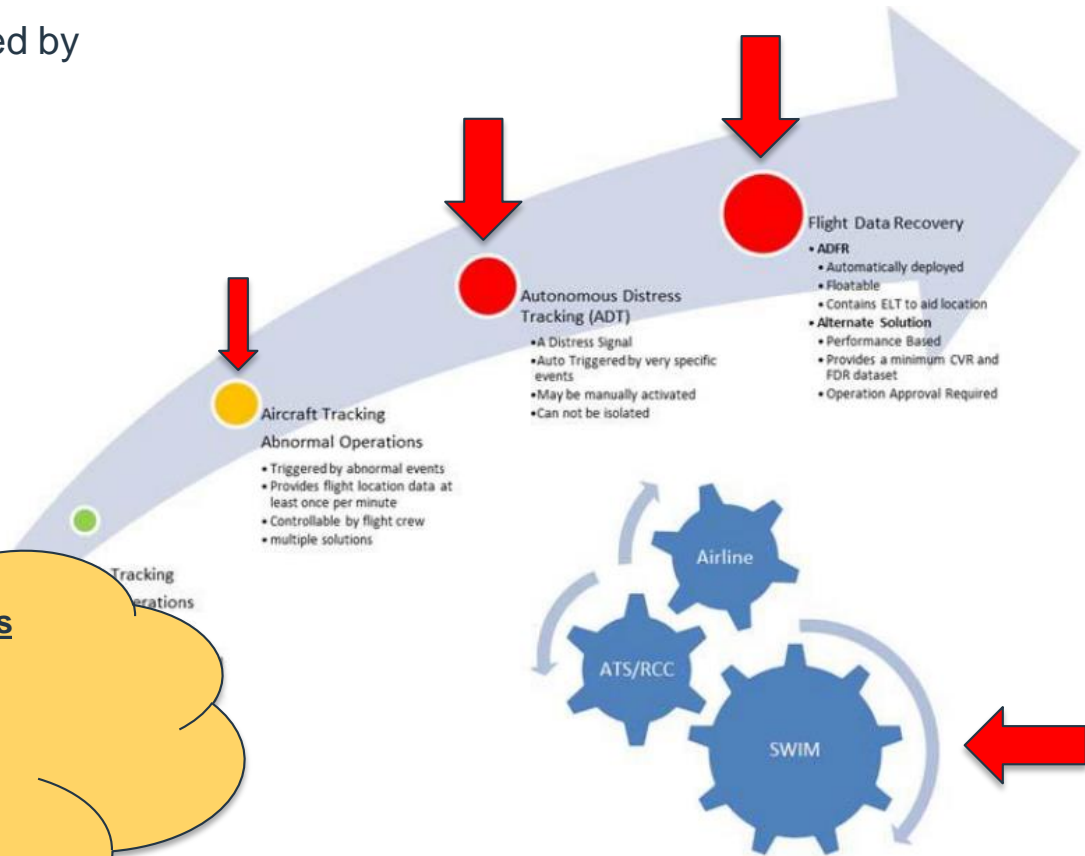
Yes: Streaming data available on wide range of flight parameters (customizable)

Tamper proof already. Has electrical power and battery backup

IMPLEMENTATION CONSIDERATIONS

- Critical capabilities, not typically used by commercial fleet

- Abnormal Tracking (?)
 - Triggered
- Autonomous Distress Tracking
 - Triggered, tamper proof
 - Independent of aircraft power or systems
- SWIM
 - IT infrastructure
 - Standards and governance
- Flight Data Recovery
 - Deployable or streaming data



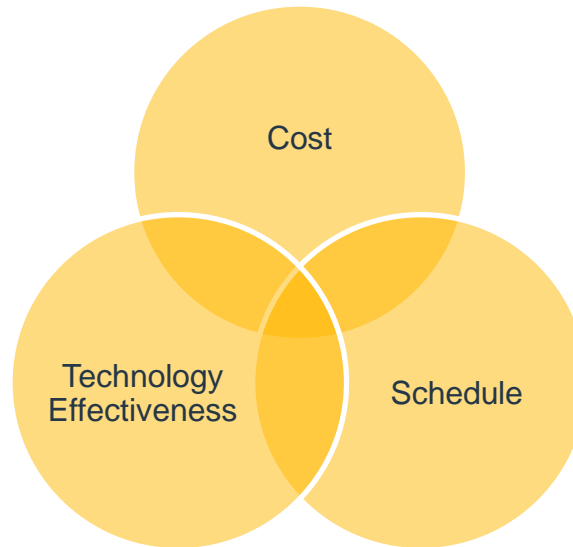
Implied or Explicit System Capabilities

- Intelligent flight status monitoring
- Intelligent flight system monitoring
- M2M communication – no human input
- Supervisory control
- Streaming data or deployable FDR
- Effective IT sharing capability – open systems, protocols and APIs, security

IMPLEMENTATION CONSIDERATIONS

- Technology Effectiveness

- Existing equipage?
 - Technology gaps? Timelines to plug gaps?
- New technology?
 - Ability to meet all GADSS requirements?
- State of internal & external IM and data infrastructure?
- Technology creep versus leap?
 - Organizational safety culture
 - Internal GADSS momentum?



- Costs

- Fleet size?
- AOG time?
- STCs needed?
- Hardware? Existing or new?
- NRE?
- Ongoing communication and data costs?

- Schedule

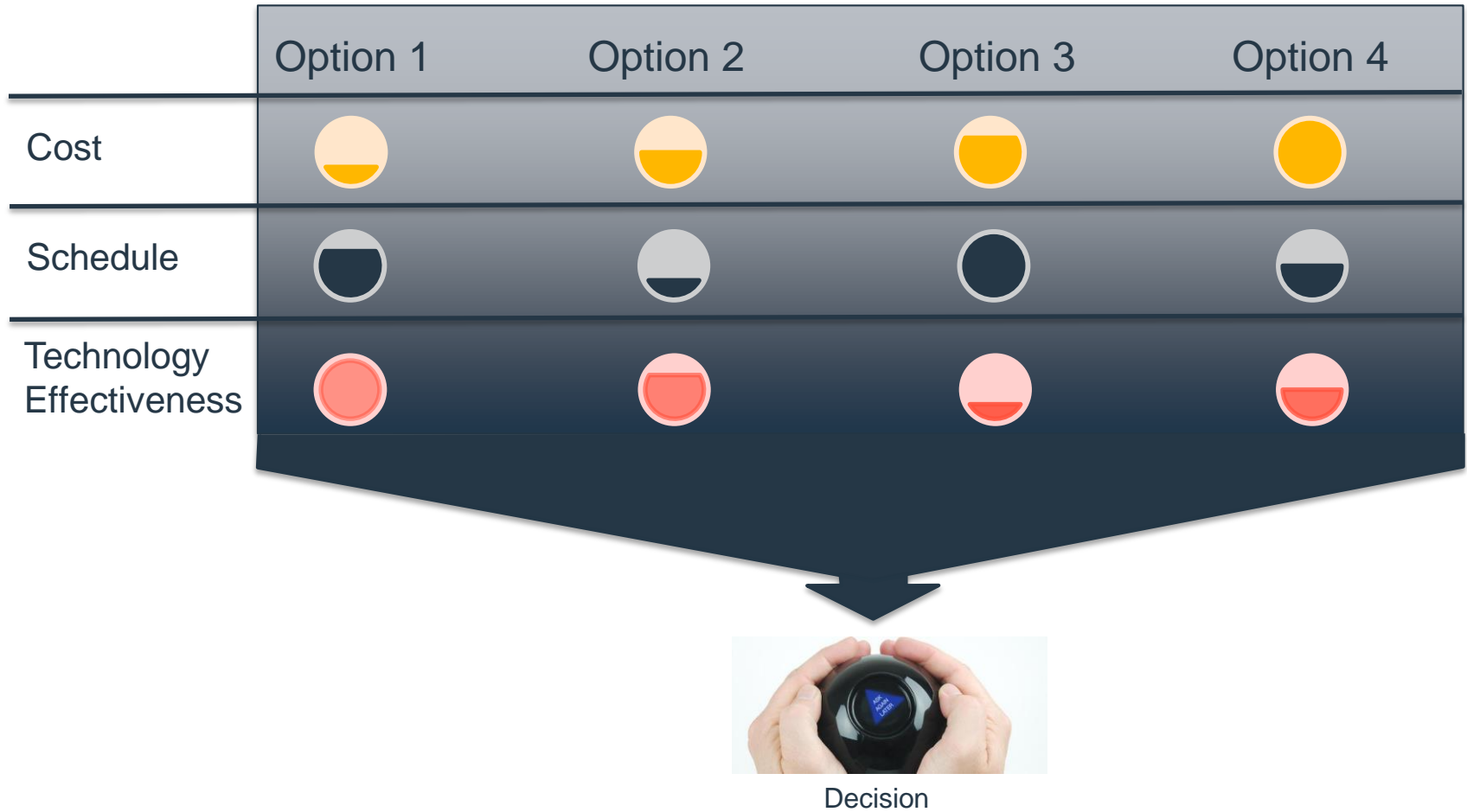
- Fleet size?
- STCs needed?
- Technology readiness?

IMPLEMENTATION CONSIDERATIONS

Requirements Matrix

GADSS Option	Technology Effectiveness											Schedule	Cost		
	Satellite footprint. / Global Coverage, Poles too	Tamper Proof Capability	Independent Power Supply	6 NM Search Radius	15 minute Normal Tracking	1 minute Abnormal Tracking	1-10 Second ADT	Automated triggering for events and tracking timing	Ability to monitor and interpret flight mode and Systems Status	Deployable FDR OR Streaming Data	SWIM Capability	STC delivery HW delivery ADT delivery	Annual Comm & Data Costs	Cost of Hardware	NRE Costs STC Costs
1															
2															
3															
4															

IMPLEMENTATION CONSIDERATIONS



SUMMARY

SUMMARY

- **Well developed holistic approach to tracking, response, and safety**
 - Not just “where is my airplane” ----- 21st century upgrade
 - Triggered events - actionable information - in a timely manner
 - Regulations still emerging at ICAO and state level
- **Key new technology underpinnings:** Explicit or Implied
- **Timelines:** Established
- **Implementation**
 - A lot of information (sometimes inconsistent)
 - Varied solutions: some available but new, some convenient starting points with longer term questions, some with elements still under development
 - Keys to full implementation: ADT trigger (intelligent interpretation of flight & system status); tamper proof; flight data recovery

TAKE AWAY

- If you haven't already started....
 - Start research/planning process for best solution for you
 - Resources required (POC, GADSS group...)
 - Develop an implementation plan, budget, and schedule
 - Not only on-board technology and communication pipeline
 - Full implementation of global ADT, flight data recovery, SWIM implementation

Mr. Henk Hof - “Time to Act”

Head of ICAO Concept Unit; EUROCONTROL member & Chairman of the ICAO ATM Requirements and Performance Panel (ATMRPP); Chairman of ICAO GADSS Advisory Group

THANK YOU

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