IntegratedEA '08
Enterprise Architecture Conference

This presentation is from the 2008 Integrated EA Conference

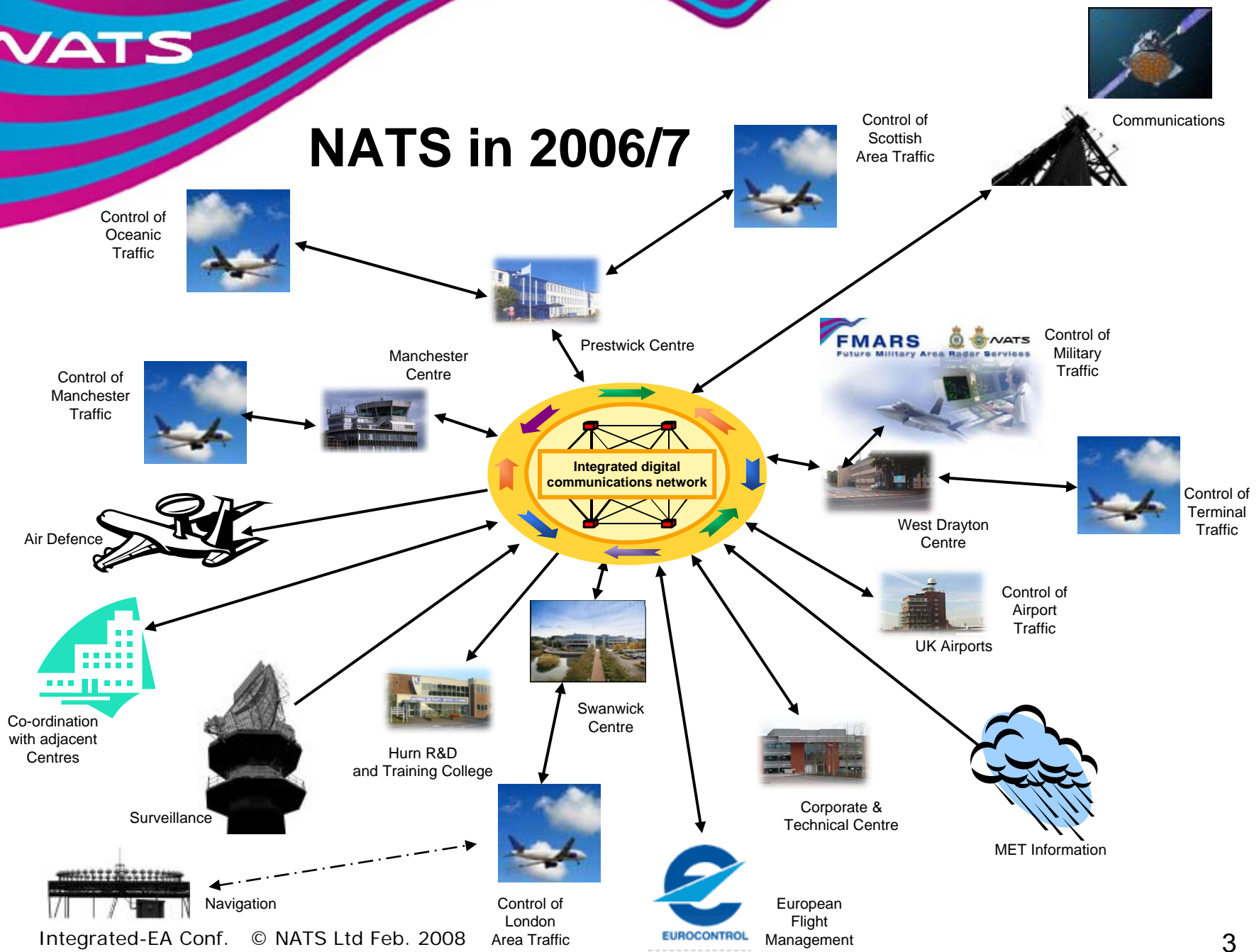The 2009 event will be held Feb 24-25
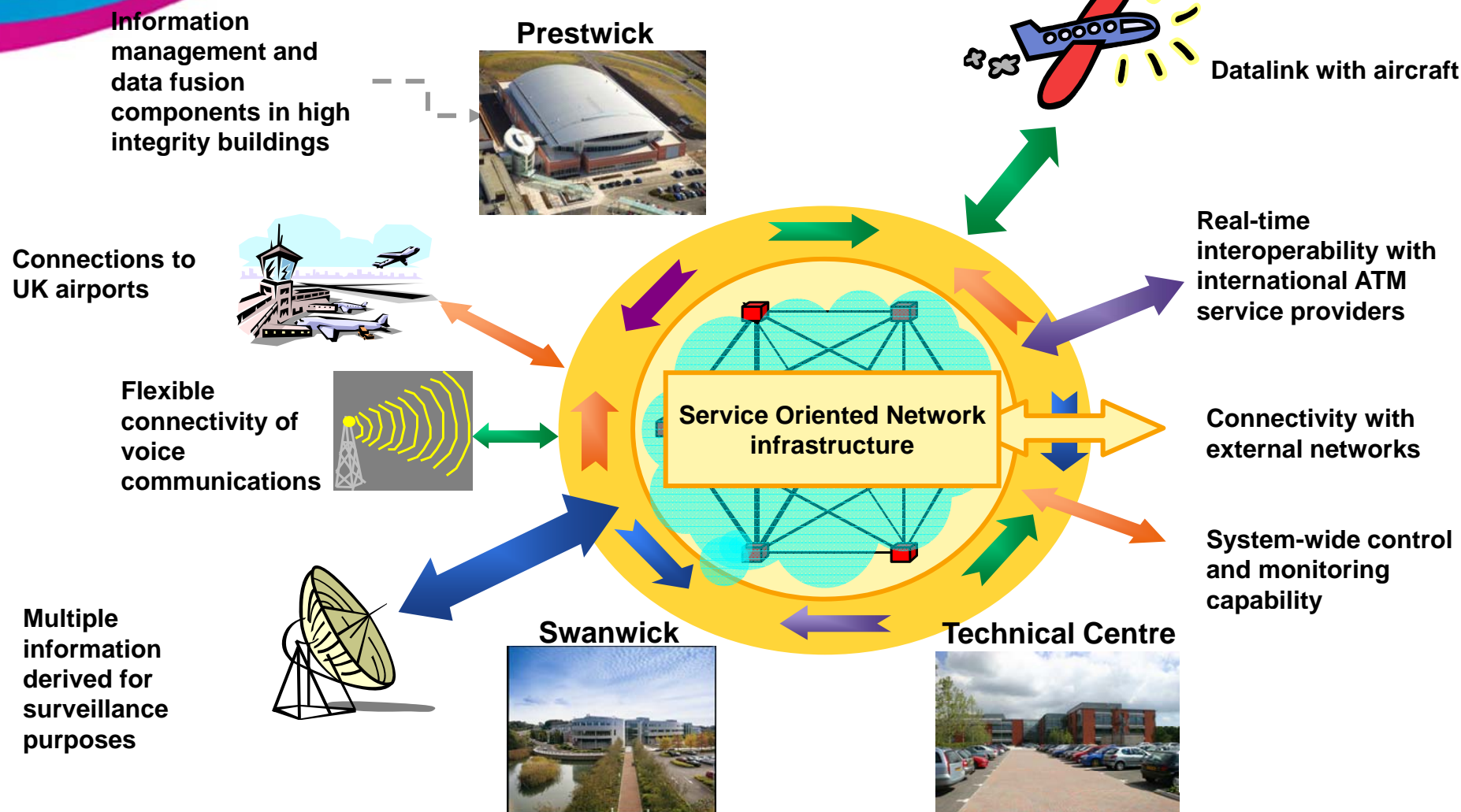
see www.integrated-ea.com

Technology Strategy Group

MODAF

A Practical Application of an Architecture Framework

Steve Winter, Chief Technologist
Peter Hotham, Chief System Architect

NATS in 2006/7

NATS in the Future

Information management and data fusion components in high integrity buildings

Prestwick

Datalink with aircraft

Connections to UK airports

Real-time interoperability with international ATM service providers

Flexible connectivity of voice communications

Service Oriented Network infrastructure

Connectivity with external networks

Multiple information derived for surveillance purposes

System-wide control and monitoring capability

Swanwick

Technical Centre

Some of NATS' Challenges

Traffic growth.
- C. 50% over the next 7 years, enhanced safety.
- Increasingly technology dependent.
- Maintaining system capacity & performance.

Compliance with Regulation & Legislation.
- Enhanced interoperability.
- Maintain licence obligations.
- Minimise environmental impact from Aviation.

Radical transformation of European ATM.
- European Collaboration setting the vision for Air Traffic Management.
- Seamless operation at lower costs across Europe.

A Roadmap?

Operational and Business Drivers.

– Captures the drivers and lays out the strategic evolution development of NATS Systems.

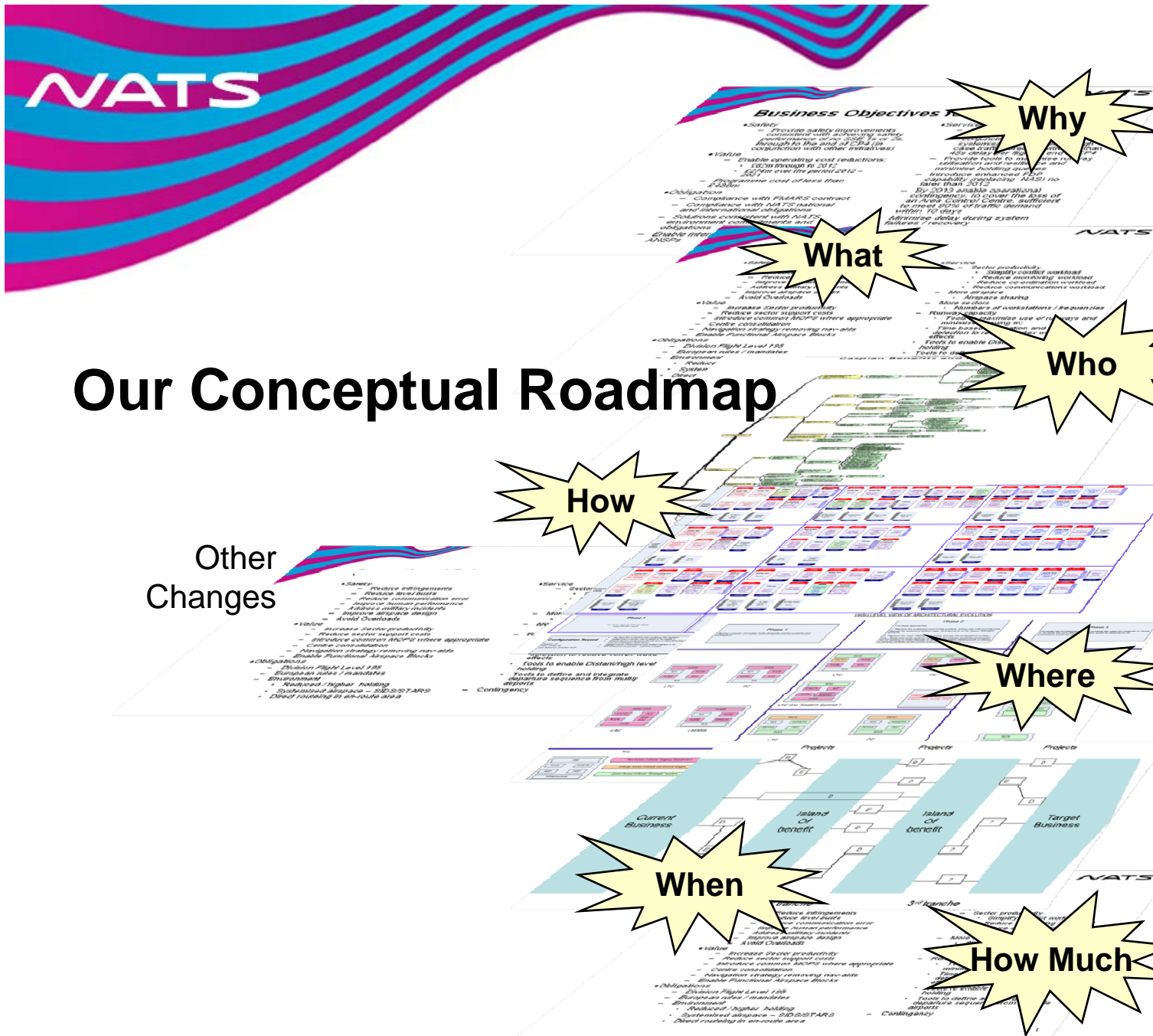– Aligns the operational needs with the technology solutions (Coherence).

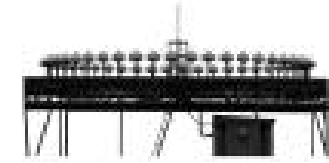**Communication** of the Strategy.

– Facilitates communication to <u>all</u> Stakeholders.

– Positive tracking of Benefit delivery.

Assurance provided.

– Explores 'What-if' scenarios and options.

– Deliverability of the strategy is assessed.

Our Conceptual Roadmap

Why — Business Objectives

What — Operational & Technical Drivers

Who — Benefits & Impacts

How — Functionality Changes

Where — System Changes

Tranche / Delivery

Other Changes

When — Acquisition

How Much

Making our Roadmap 'Reality'

This must have been done before?

- Must not re-invent.
- Look to industry best-practice …

An Architecture Framework?

- Examples include Zachman, TOGAF, DODAF, MODAF, RUP, etc.
- ATM no different to any other large complex system of systems, e.g. military.
- MODAF contains many of the views we needed.

MODAF

How should we use MODAF?

- MODAF CAN be:
  - Daunting
  - Too many views
  - Too much to understand
- We NEED to:
  - Focus on the Roadmap goals
  - Only choose views of most value
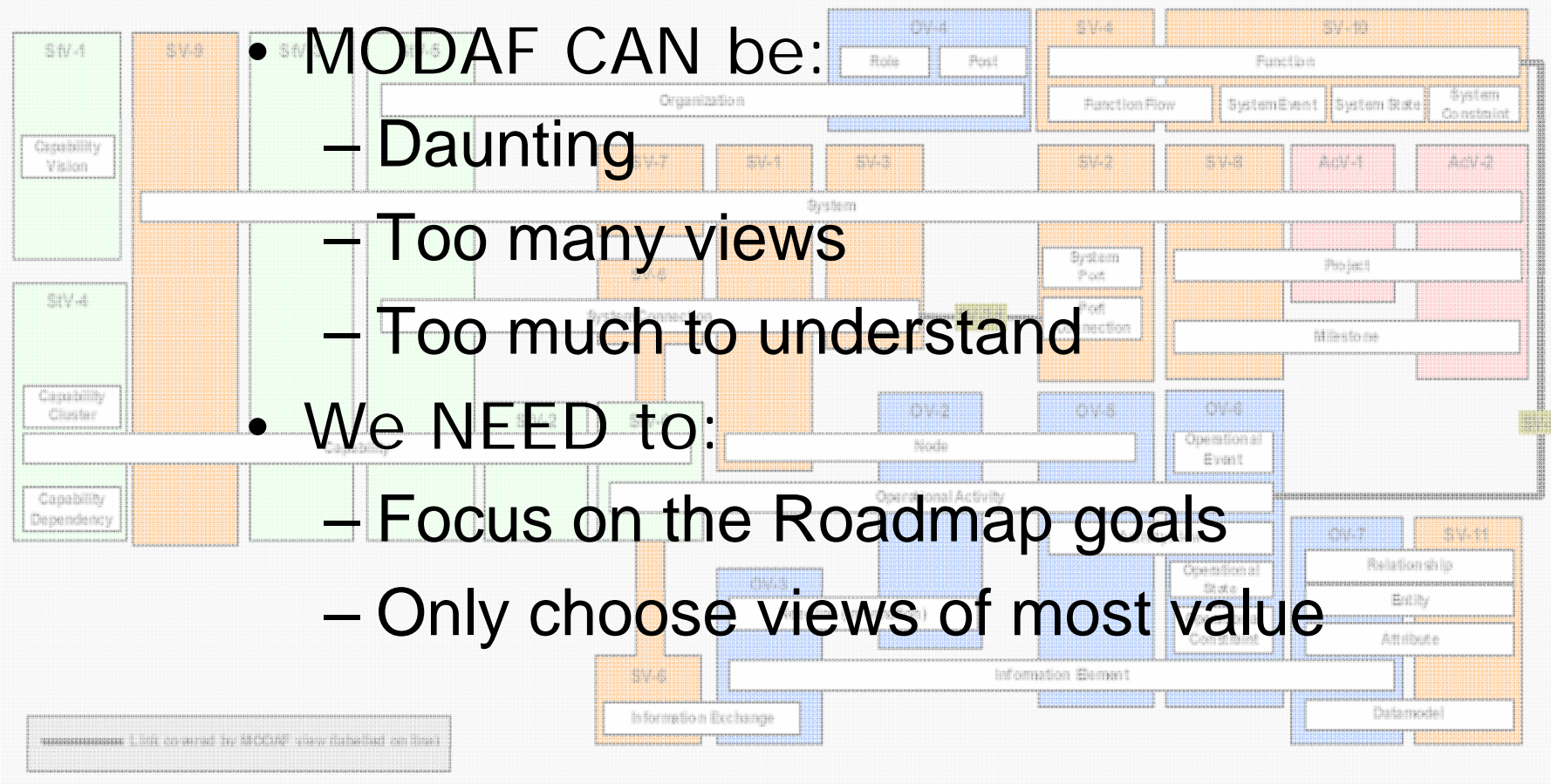
NATS Application of MODAF (to date)

MODAF Views.
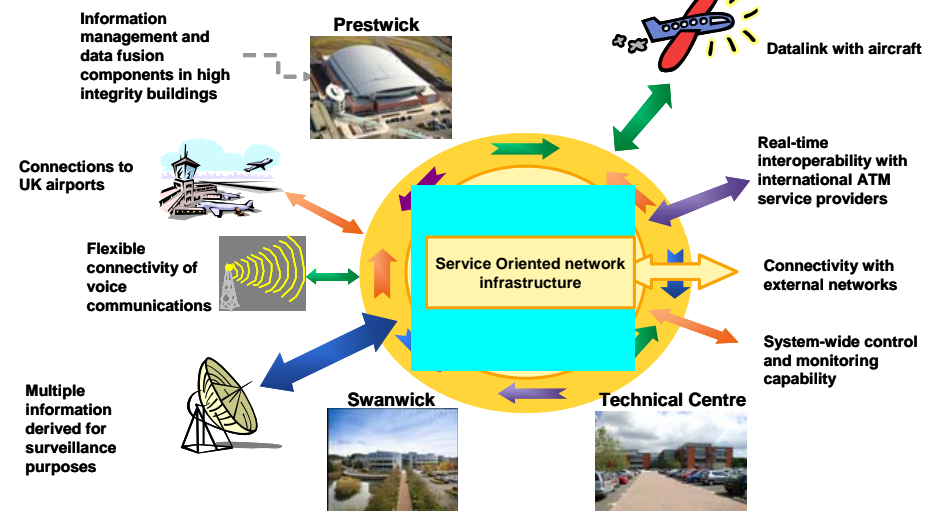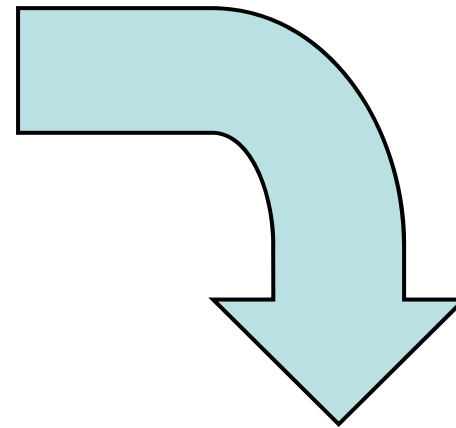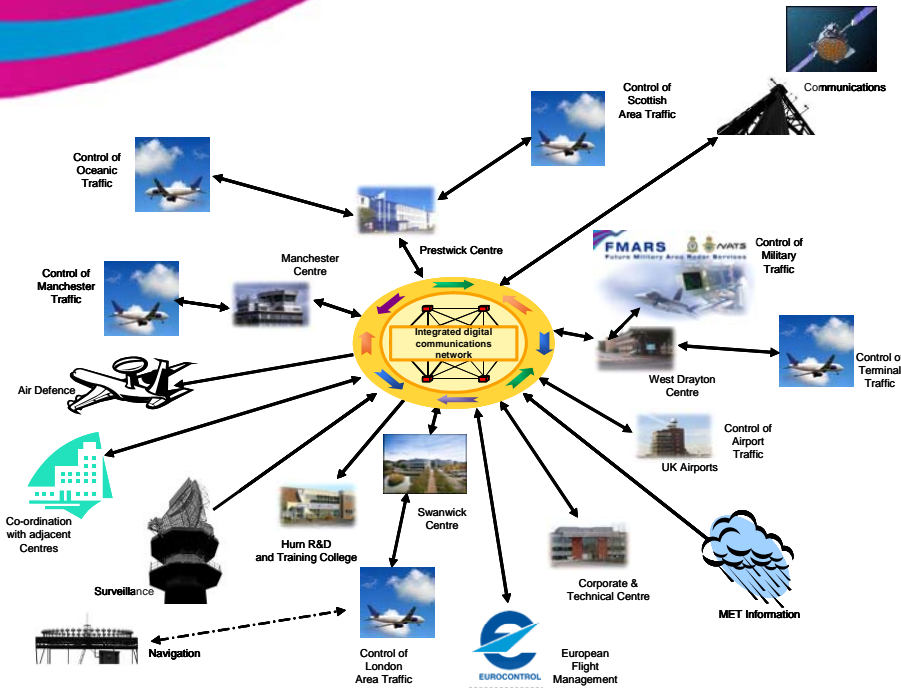- OV-1, OV-5.
- SV-3, SV-5.
- StV-3.
- StV-5.

Non MODAF and evolved MODAF views.
- Product list/cost estimates.
- Development/Deployment matrices.
- High-level Architecture Evolution.

OV-1a: Ops Concept Graphic

Control of Scottish Area Traffic

Communications

Control of Oceanic Traffic

Control of Manchester Traffic

Manchester Centre

Prestwick Centre

FMARS Future Military Area Radar Services

Control of Military Traffic

Air Defence

Integrated digital communications network

West Drayton Centre

Control of Terminal Traffic

Co-ordination with adjacent Centres

Control of Airport Traffic

UK Airports

Surveillance

Swanwick Centre

Hurn R&D and Training College

Corporate & Technical Centre

MET Information

Navigation

Control of London Area Traffic

EUROCONTROL

European Flight Management

Information management and data fusion components in high integrity buildings

Prestwick

Datalink with aircraft

Connections to UK airports

Flexible connectivity of voice communications

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OV-5: Operational Activity Model

Key:

Functional Dependencies

Text and box border colour indicates priority:

Level 1 – Red – highest
Level 2 – Purple
Level 3 – Blue – lowest

Change since last issue if present

Human Performance

Value

Capacity

1
2
3
32

Has a beneficial impact on Human Performance

Has a beneficial impact on Costs

Green if has a beneficial impact on Environmental Performance

Has a beneficial impact on Capacity

Facility	OpF#	Operational Function / System Component — Number of Products (inc dupls) = 44	FDP	SDP	SNET	Tact HMI
TC	1	Operational Function 1			NODE	NODE
TC	3	Operational Function 2		NODE		NODE
TC	6	Operational Function 3		NODE		
TC	2	Operational Function 4	NAS CCDS?	NODE	NODE	NODE
TC	4	Operational Function 5			NODE	NODE
TC	5	Operational Function 6				
TC	10	Operational Function 7	NAS			COTS
TC	34	Operational Function 7		NODE	NODE	NODE
TC	33	Operational Function 8				
TC	36	Operational Function 9	EFD			
AC	1	Operational Function 1		NODE	NERC	NERC
AC	2	Operational Function 2	NAS SFS CCDS?	NODE	NERC	NERC
AC	7	Operational Function 3	NAS EDDUS			
PC	3	Operational Function 1		NODE		NODE
PC	1	Operational Function 2			NODE	NODE
PC	2	Operational Function 6	NAS CCDS?	NODE	NODE	NODE
PC	4	Operational Function 7			NODE	NODE
PC	6	Operational Function 8		NODE		
PC	10	Operational Function 9	NAS			COTS
PC	34	Operational Function 10		NODE	NODE	NODE
PC	33	Operational Function 11				
PC	35	Operational Function 12		NODE		
PC	6	Operational Function 13		NODE		
PC	36	Operational Function 15	EFD			

TRANCHE	3	3	3	3	3	3	3	4	4	4	4	4	6	6	6	6	6	8	8	9	9	9	9	9	9	9	9	9	9	9	10	10	11	11	11	11
Fn #	1	3	4	5	33a	34	35	2	6	6	10	36	8	9	12	13	15	14	17	22	23	X	24	25	26	28	29	30	33b	19	31	37	38	39		

Functional Thread > — Description: Enhanced STCA (SFL); 3NM Surveillance (MRT); Controlled Airspace Intrusion Tool (CAIT); Near Real-time Weather Picture; RTF Frequency Occupation (Workload Management); Base of Cover Proximity Warning for Military; Surveillance - Wind Farm Plot Filtering; Mode S Flight Id Surveillance; AMAN Stack Departure Time EGPH/EGPF; AMAN Stack Departure Time EGCC (EATPC Replacement); Electronic Flight HMI; Airfield Interface; Pilot Intent Monitoring CFL/SFL; Minimum Safe Altitude Alert (MSAW); Basic Airspace Proximity Warning (APW); Basic AGDL for non-control messages ("Link 2000+" subset); AMAN Sequencing/Metering/Planned Spacing Tool for EGPF/EGPH/EGCC; Full OLDI Coordination (OLDI/SYSCO); Tactical Separation Monitor for TMA; Multi-Sector Planner (MSP); FACTS Planner Capability w/electronic flight HMI; FACTS tactical tools with electronic flight HMI for ER; Advanced Airspace Proximity Warning (AAPW); Advanced AGDL (CASCADE); FDP Interoperability (IOP); Vertical Conformance Monitoring; Longitudinal Conformance Monitoring (4D); Tactical Trajectory Prediction with Mode S DAPs; RTF Frequency Occupation (Workload Management); Dynamic Display of Restricted Airspace Volumes ("Dynamic Video Maps"); Safety Nets with Mode S DAPs; Dynamic sectorisation; Graphical Route Editing; PRNAV Route Allocation; Display Downloaded Aircraft Parameters (DAPs).

Surveillance Data Processing

	1	3	4	5	33a	34	35	2	6	6	10	36	...
	x	x	x			x	x	x	x	x			

NODE Tracker and Conflict Alert Computer — **ARTAS**

													8	9	12			14												19			
													x	x	x			x												x			

NSNETS

- Look for gaps or duplicates over the phases.
- Traces to our SV-5, OV-5, phasing and delivery models.
- Time axis is by logical Epoch.
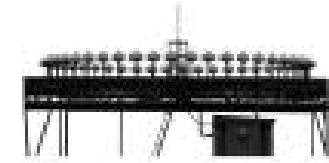
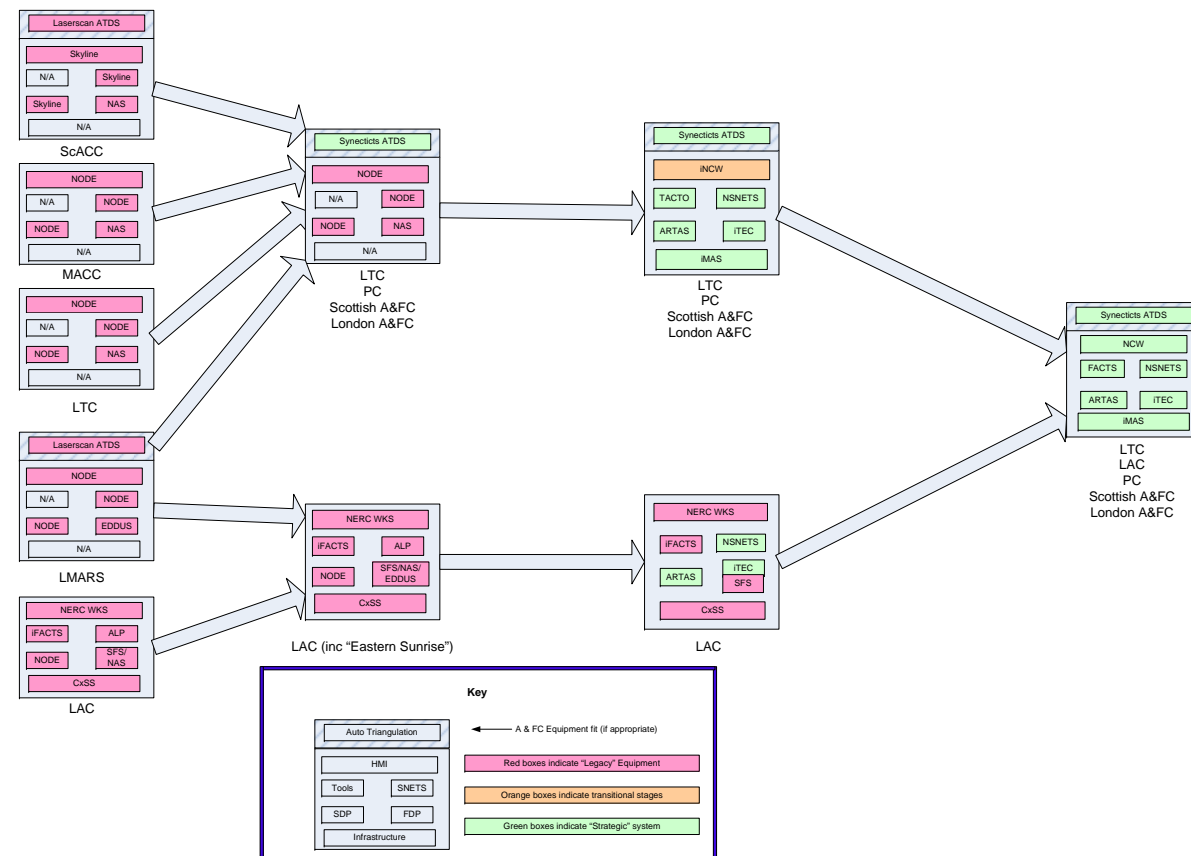# StV-3: Capability Phasing (Part 2)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
LAC		Event 1									
LTC											
SAC			Event 2								
PC					Event 9			Event 14			
MAC			Event 12								
SMil											
LMil		Event 13									
OAC											
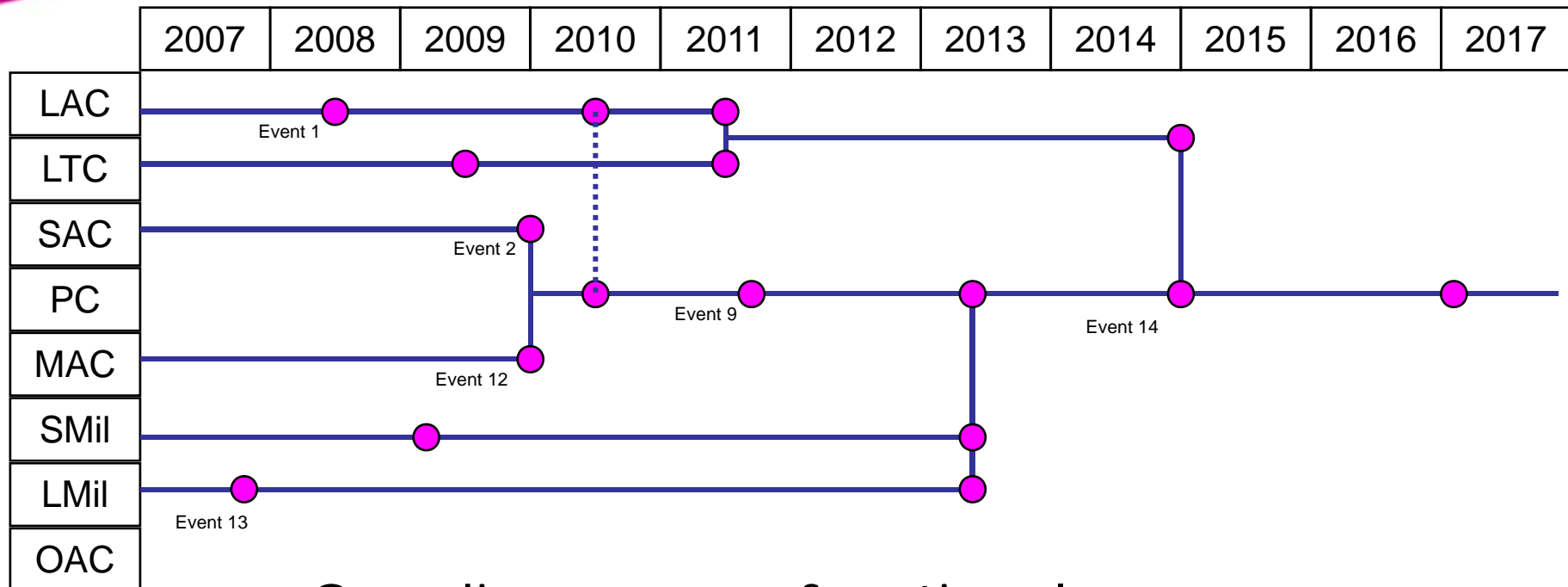
- One diagram per functional area.
- When in time a particular capability per Service Unit will be available, adds the date axis.

StV-5: Capability Deployment Mapping

How it all fits together

Strategic Requirements Related to Operational and Business Drivers

Functional Driver Document (OV-1)

Describes the required deployment of functions for each Centre Operation

Description of the Evolution of the Operations towards a target architecture

OV-5 Operational Activity Model

Identifies the systems impacted by each of the Functional Drivers

StV-5 High Level Architectural Evolution Diagram

SV-5 Ops Activity to System Function Matrix + SV-3

Identifies the system changes required to achieve the functional drivers

Describes System Evolutions related to Functional Drivers

SV-5 Product to Ops Function Matrix

Architectural Evolution Diagrams

Quantify changes in terms of SLOC (S/W) and Capital (H/W)

Cost Model

Deployment Model (StV-3)

Groups the functional change into deliverable groups impacting common areas

MODAF – Our Lessons Learnt

A good OV-5 and SV-5 are really key.
  – clearly articulates the business objectives.
  – map business objectives to complex legacy systems infrastructure.

The right implementation team.
  – Backing from Executive, business buy-in.
  – Access across the organisation, ensure there are no barriers.

Do not use MODAF slavishly.
  – Do not use all the views immediately, look at most benefit.
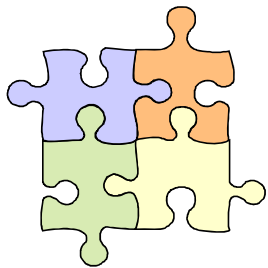 – Capture supporting detail elsewhere.

Well received by a broad audience.
  – Output applicable & useful to many audiences.
  – Key stakeholder buy-in through effective communication.

The Road to Tools

Avoid using tools too soon.
- Key stakeholders and contributors not comfortable using an "engineering" tool.
- We are now piloting a tool and working with the vendor to implement a structure that works for us.
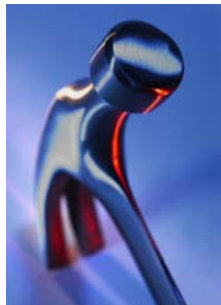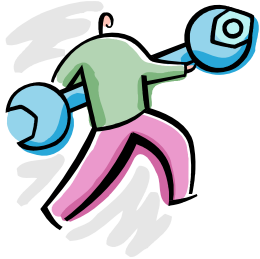
Be clear what you need tools to do for you
- Enhance visibility and configuration control.
- Cost-effective maintenance of the roadmap.
- Support assessment of change – agility.
- Maintain effective communication to all.
- Establish a good fit to your business needs.
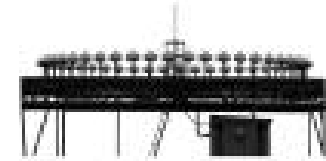
Our Future Plans and Progress

Migration to Tools
- Conclude the pilot assessment.
- Configuration Control of roadmap artefacts.
- Review other MODAF views inc. Service views.

Embedding the Process.
- Extend the roadmap across all our technology areas.
- Maintain a clear definition of our Systems and their evolution over time.
- Re-alignment of the business to better deliver.
- Maintain ownership of the different views by key stakeholders across the business.

Communication
- Continue to communicate progress as we move forward.

Any Questions?