



# Trajectory Based Operation (TBO) Animated Storyboard

11<sup>th</sup> Annual Verification & Validation Summit

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Date: September 14<sup>th</sup>, 2016



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# Quote

"The single biggest problem in communication is the illusion that it has taken place."

- George Bernard Shaw

# Why Animated Storyboard?

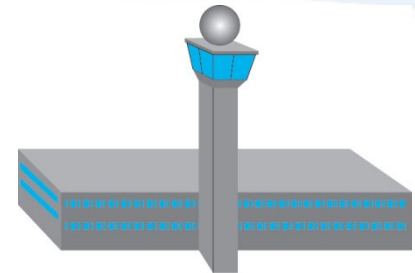
- Method to Tell a Story About NextGen
  - ✦ Simplifies & Communicates:  
**“How Our Technologies Work”**
  - ✦ Builds a Community that Can:  
**“Tell Our Story”**

*We are taking on a difficult challenge and can lead the way!*



# Storyboard Approach

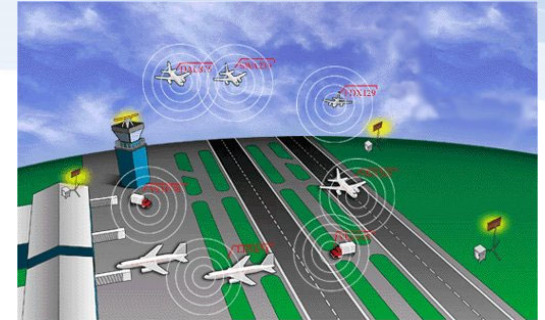
- **Low Fidelity Animation**
  - Overview & Detail
  - Standardize ICONs, Eliminate Clutter!!
- **Subject Matter Experts**
  - Wealth of Knowledge
  - Every Domain, Program, Capability (2+)
- **Test Laboratories**
  - Conduct “Live” Scenarios of Functions, Features, and Capabilities
- **Documentation**



# Storyboard Architecture

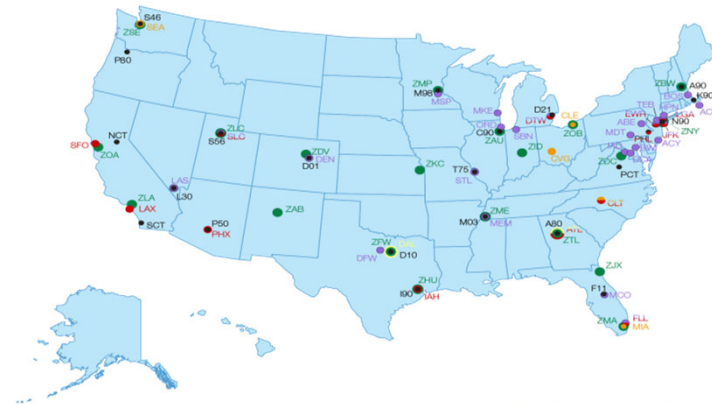
- **Overview Storyboards**

- Foundational Programs/Systems (*e.g. ERAM, TAMR/STARS, ASDE-X etc.*)
- Enabling Programs/Systems (*e.g. Datacomm, TFMS, SWIM, NVS etc.*)
- Capabilities and Emerging Services (*e.g. TBO, UAS etc.*)



- **Detailed Storyboards**

- Text Descriptions
- Deployment Maps
- Video Files (*e.g. TBO*)



# What is Next Gen?

- NextGen is showing Next Gen Air Transportation System
- Air traffic program development modernize today's National Air Traffic System (NAS)
- Made up of a series of services designed to make the airspace system more efficient
- Initiatives include *...ing system capabilities*  
*integrations*

STARS

TFMS

TBO

CSS/Wx

SWIM  
NAS  
DATA

ERAM

Data  
Comm

ADSB

PBN





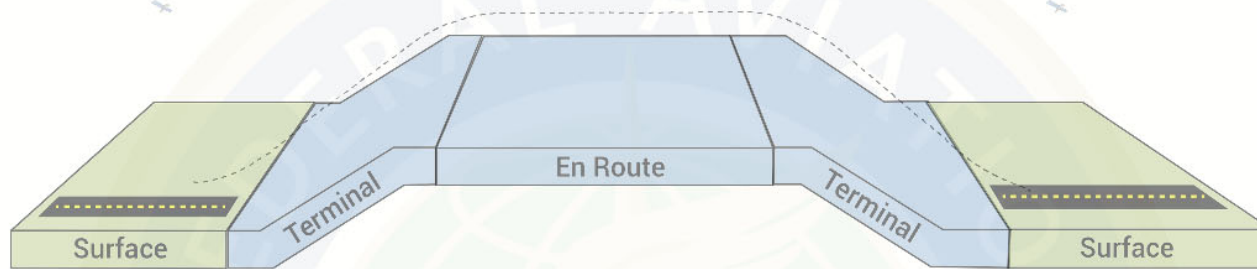
Home

# NextGEN Overview Storyboard

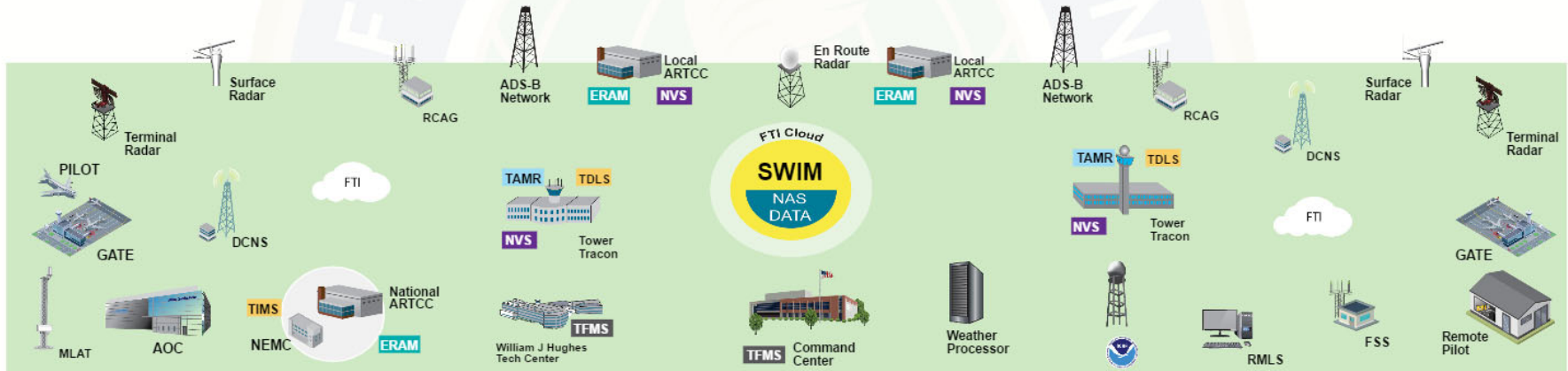
Detailed Program Information

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Phases of Flight



Infrastructure



Programs



Capabilities



BETA Version for Demonstration Only!

Developed by : William J. Hughes Technical Center Verification and Validation Strategies and Practices Branch POC: Harry Bilicki - 609-485-5143



# *Trajectory-Based Operations*



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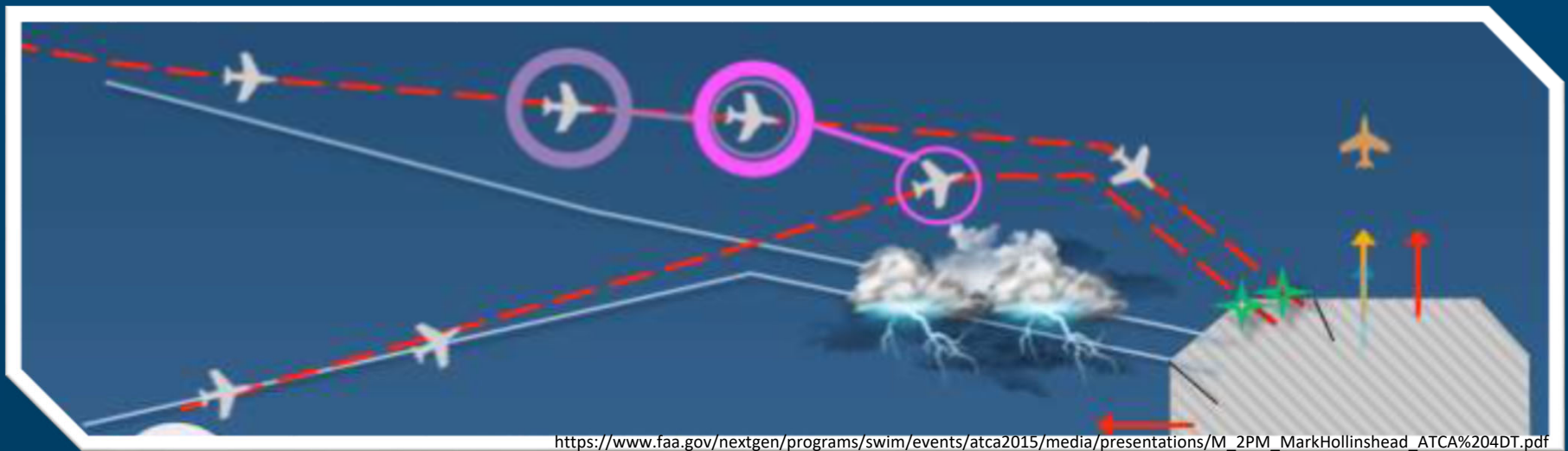
Next**GEN**

# Trajectory-Based Operations



# Trajectory-Based Operations

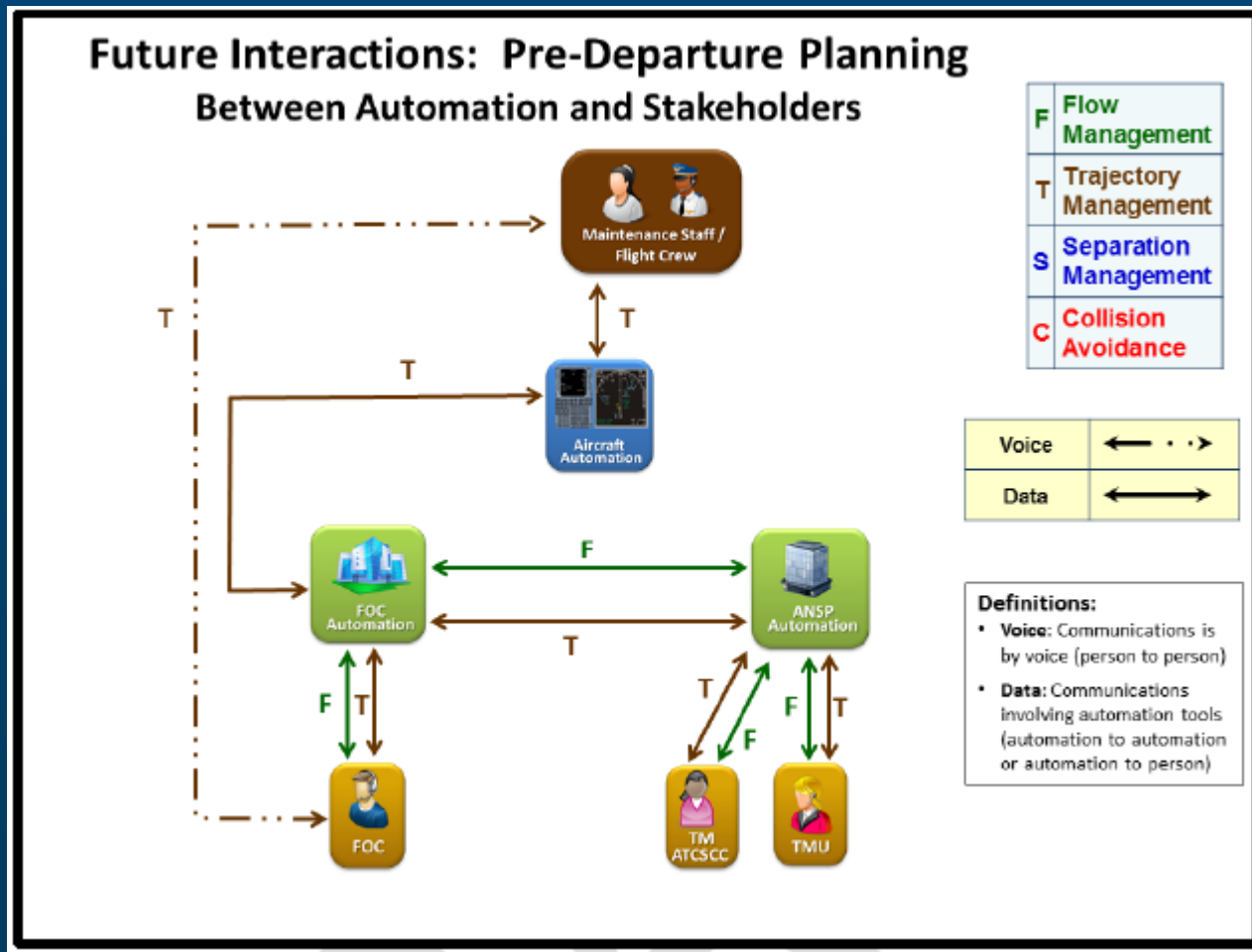
- Offers the ability to use Elastic Vectors



TBO requires the following key enabling technologies:



# Trajectory-Based Operations



PHASE  
**1** Pre-Negotiation

Implemented  
Today!

PHASE  
**2**

PHASE  
**3**

PHASE  
**4**

The AOC generates a  
Trajectory Options Set (TOS)  
consisting of its  
desired trajectories



Airline Operations Center

# Pre-Departure Flight Planning



Airline Operations Center

PHASE  
**1**

PHASE  
**2**

Negotiation

Implemented  
Today!

PHASE  
**3**

PHASE  
**4**

1. The **AOC** submits the TOS to **TFMS** @ the **WJHTC**
2. **TFMS** returns its desired trajectory to the **AOC**

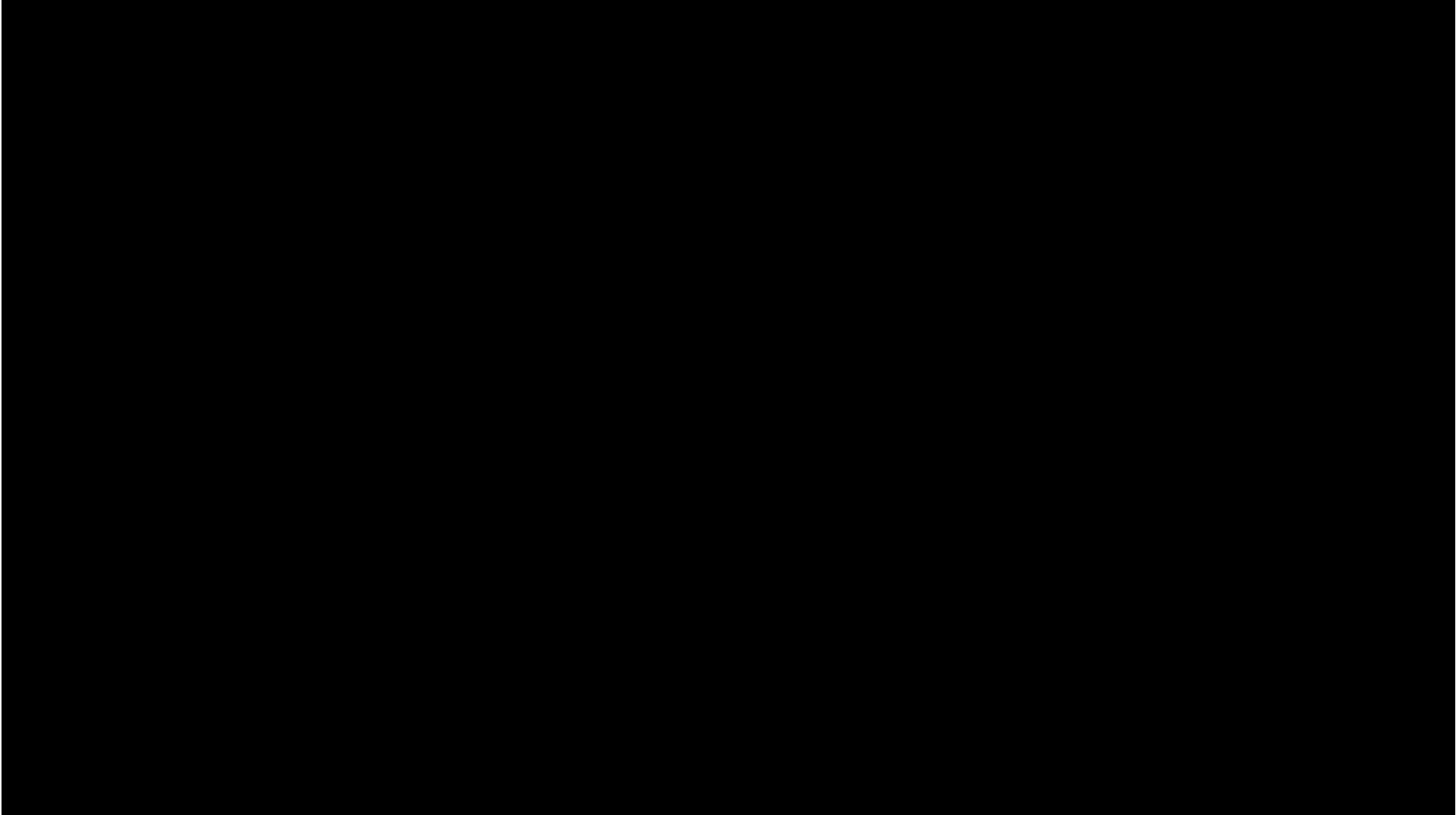


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Next**GEN**



PHASE  
**1**

PHASE  
**2**

PHASE  
**3** Agreement

Implemented  
Today!

PHASE  
**4**

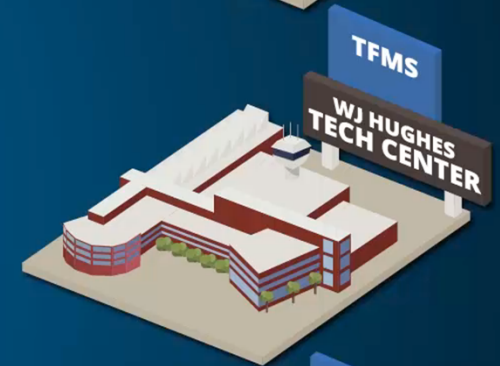
The negotiated trajectory  
is **accepted** by the AOC &  
flight crew and a **flight plan**  
is filed to ERAM



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Next**GEN**

# Pre-Departure Flight Planning



PHASE  
**1**

PHASE  
**2**

PHASE  
**3**

PHASE  
**4**

Execution

Under  
Development

Aircraft **executes** the  
negotiated **trajectory**  
(If needed, trajectory can  
be renegotiated)





# Questions

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Storyboard Website:

[https://www.faa.gov/about/office\\_org/headquarters\\_offices/ang/offices/tc/library/Storyboard/nextgen-overview.html](https://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/Storyboard/nextgen-overview.html)

