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# Unmanned Aircraft Systems Airspace Integration Joint Test



*Aviation Rulemaking Committee*

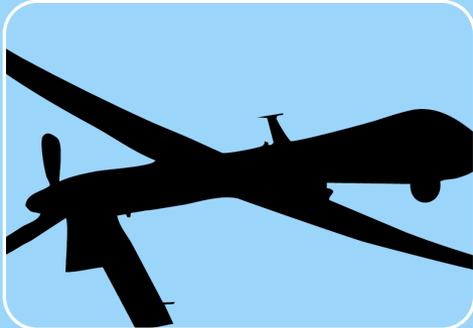
*April 29 2015*

**Mr. Tom Baker**

*Joint Test Director*

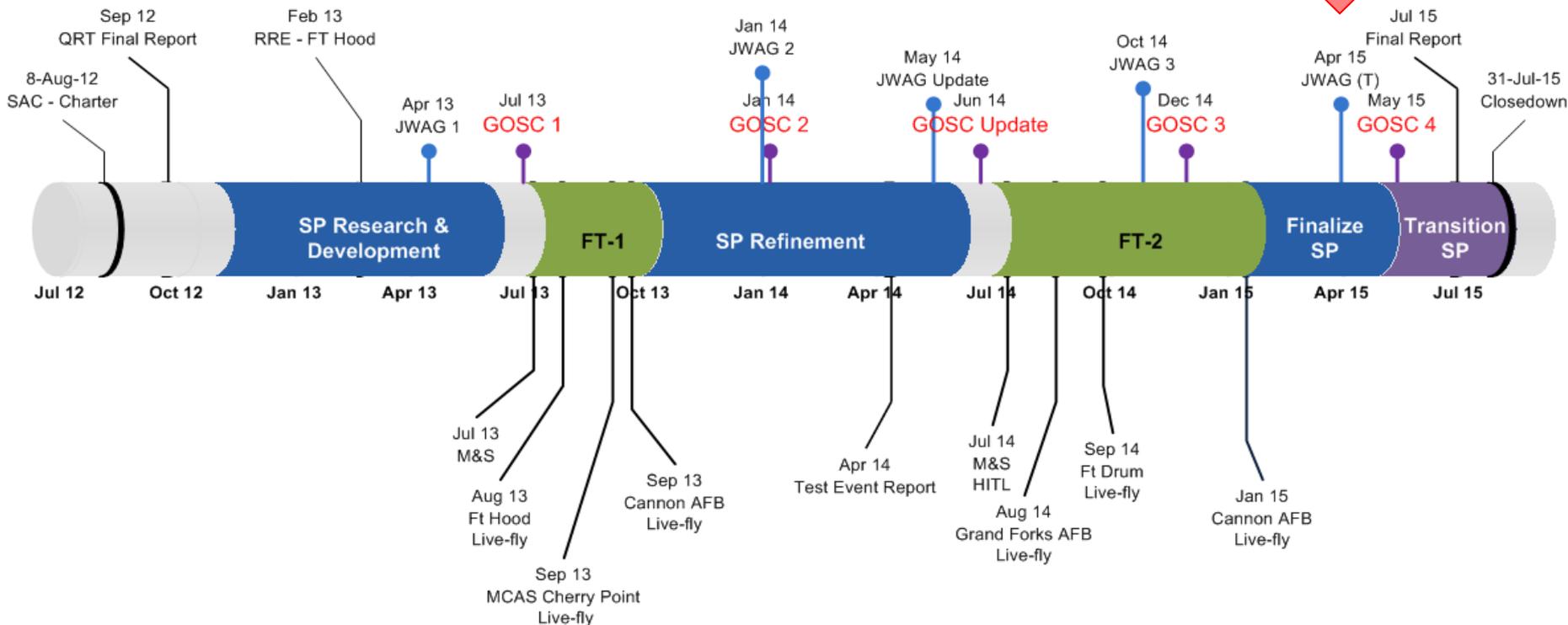
# DoD Airspace Integration Plan

Established three tenets in order for UAS to fly in the NAS

			
Tenet	<b>Airworthiness</b>	<b>Pilot/Operator Qualifications</b>	<b>Regulatory Compliance</b>
Activity	<b>MIL-HDBK-516 (DOD)</b>	<b>CJCSI 3255.01 (Joint Staff)</b>	<b>Standardized Procedures</b> <b>COA Refinement</b>

# UAS-AI JT Schedule

## We are here



FT = Field Test  
 JT = Joint Test  
 IPWG = Initial Planning Working Group

HITL = Human-in-the-loop  
 JWAG = Joint Warfighter Advisory Group  
 MPWG = Mid-phase Planning Working Group

GOSC = General Officer Steering Committee  
 SP = Standardized Procedures  
 FPWG = Final Planning Working Group



# Test Sites

## Modeling & Simulation Sites

MITRE , McLean, Virginia

William J. Hughes FAA Technical Center, Egg Harbor Township, New Jersey

## Live-Fly Test Sites

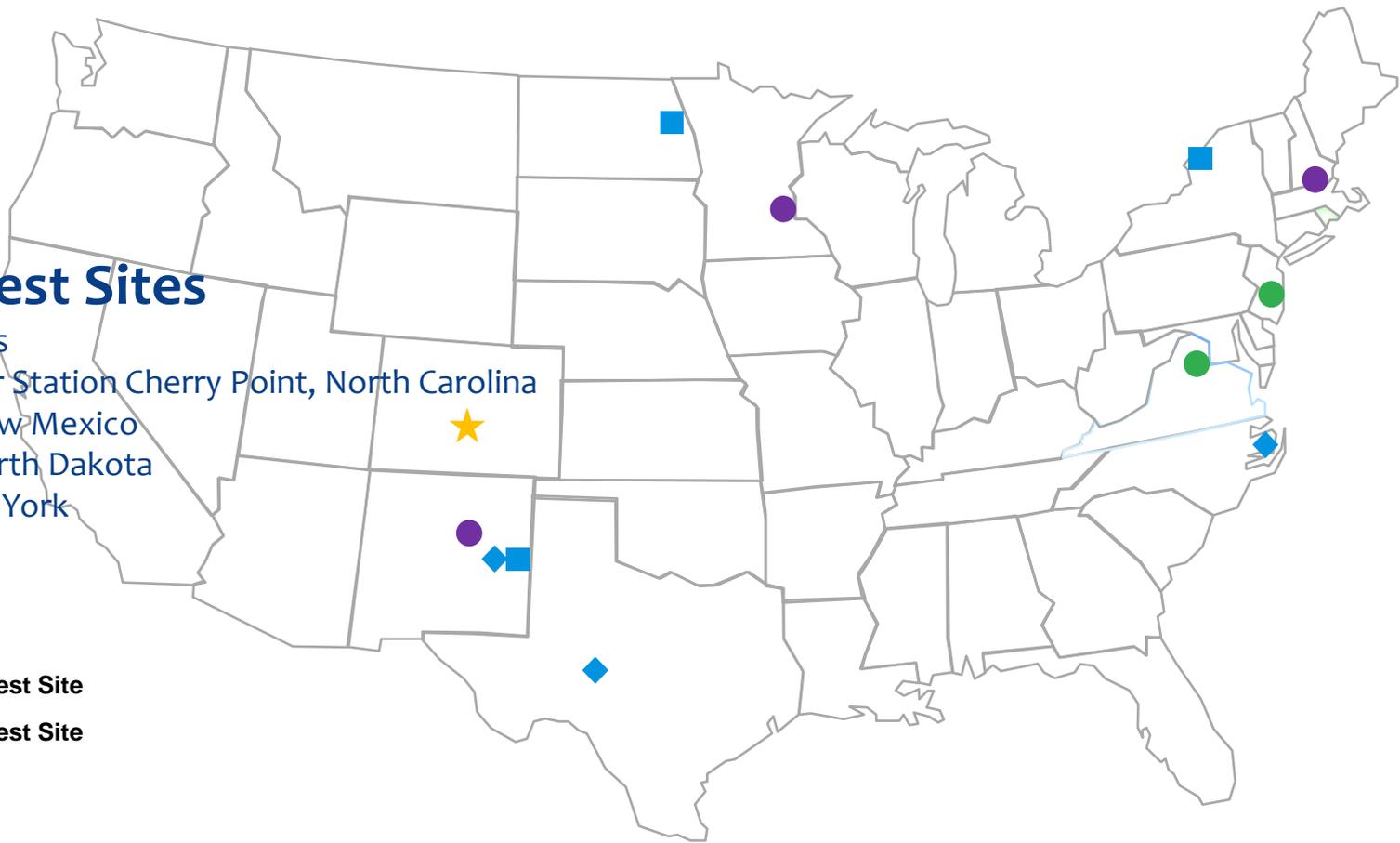
Fort Hood, Texas

Marine Corps Air Station Cherry Point, North Carolina

Cannon AFB, New Mexico

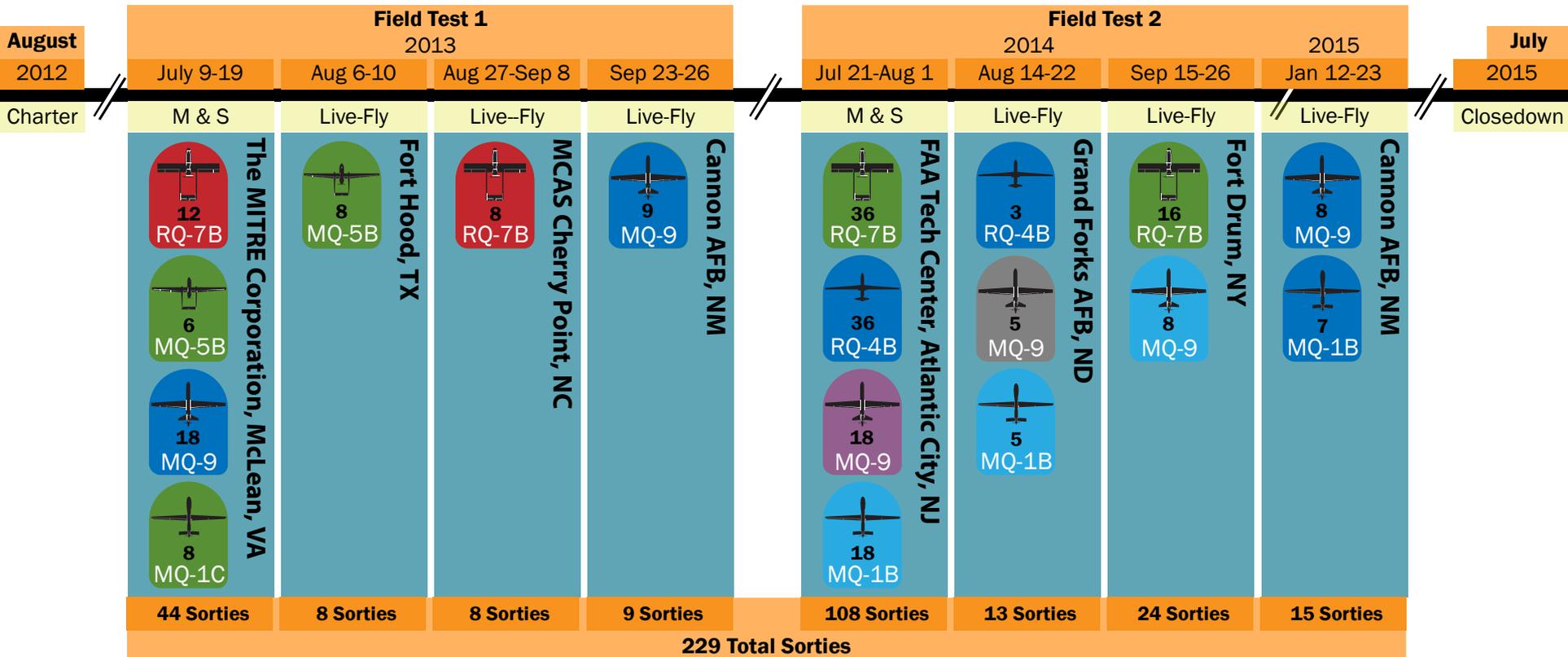
Grand Forks, North Dakota

Fort Drum, New York



- M&S Test Site
- ◆ FT-1 Live-Fly Test Site
- FT-2 Live-Fly Test Site
- ★ Joint Test HQ
- FAA ARTCC

# Test Timeline



- Army
- Air Force
- Marines
- Federal Interagency
- Air National Guard
- Customs and Border Protection

# The Problem in Detail

**Flight procedures differ significantly between locations and agencies (COAs)**

**No standardized FLIP for terminal Area UAS operations**

- Pilots not provided approved charts
- UAS details don't exist in publications

**UAS specific guidance not yet fully developed**

- IFR vs. VFR?
- Common terminology

**Knowledge of UAS capabilities and limitations lacking for key personnel**

- ATC
- Other users of DOD airspace (civilian and military)

# Questions?

# UNFO SP and Chart Overview



**CW4 Mark Burrows**  
*JT Standardization and Safety Officer*  
**Mrs. Dana Whitman**  
*JT ATC SMA*

# What is the UNFO SP?

## Part One

*Provides a single source descriptive guide to ensure operationally*

Effective  
planning

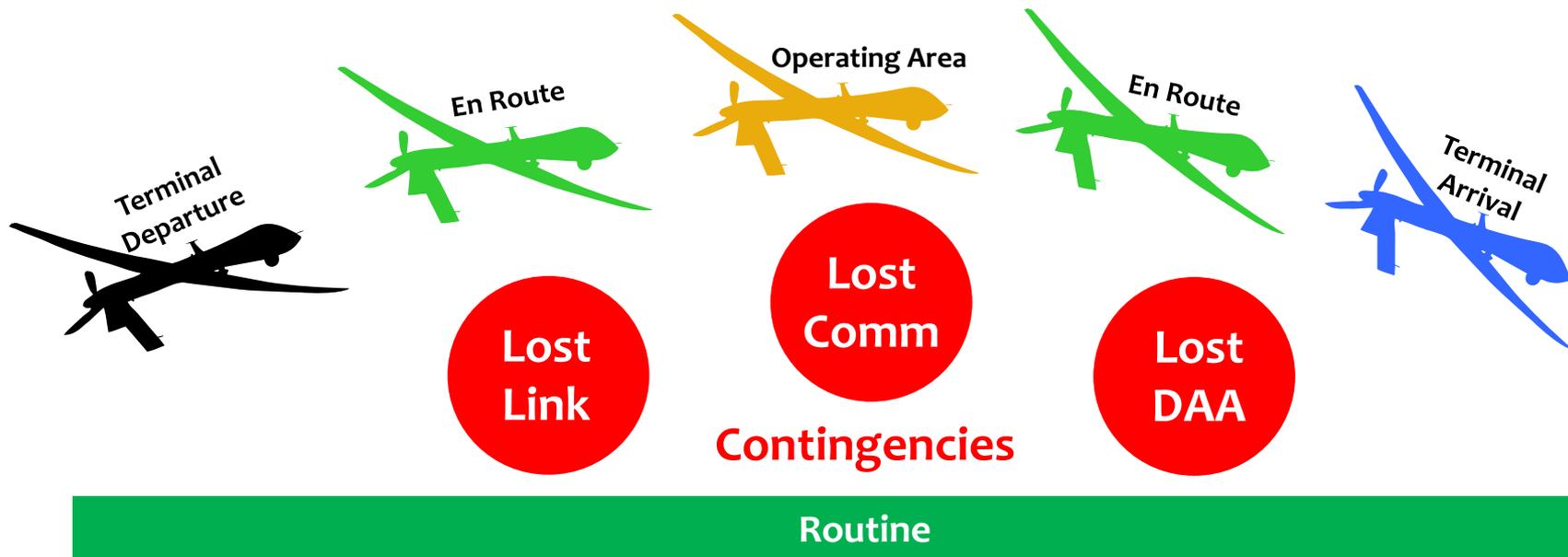
Safe and  
Efficient  
Integration

Utilization of  
UAS in the  
NAS

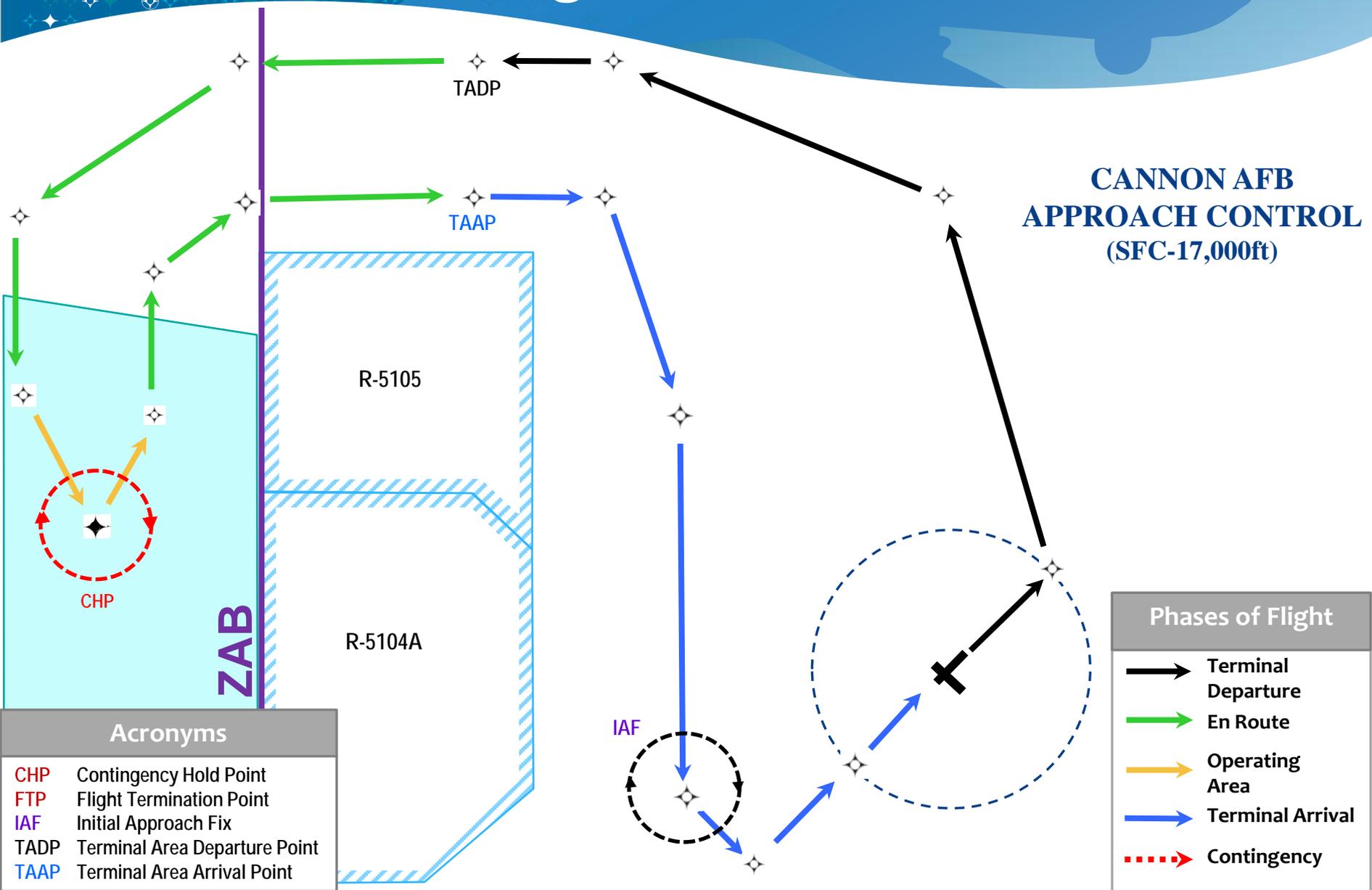
# What is the UNFO SP?

## Part Two

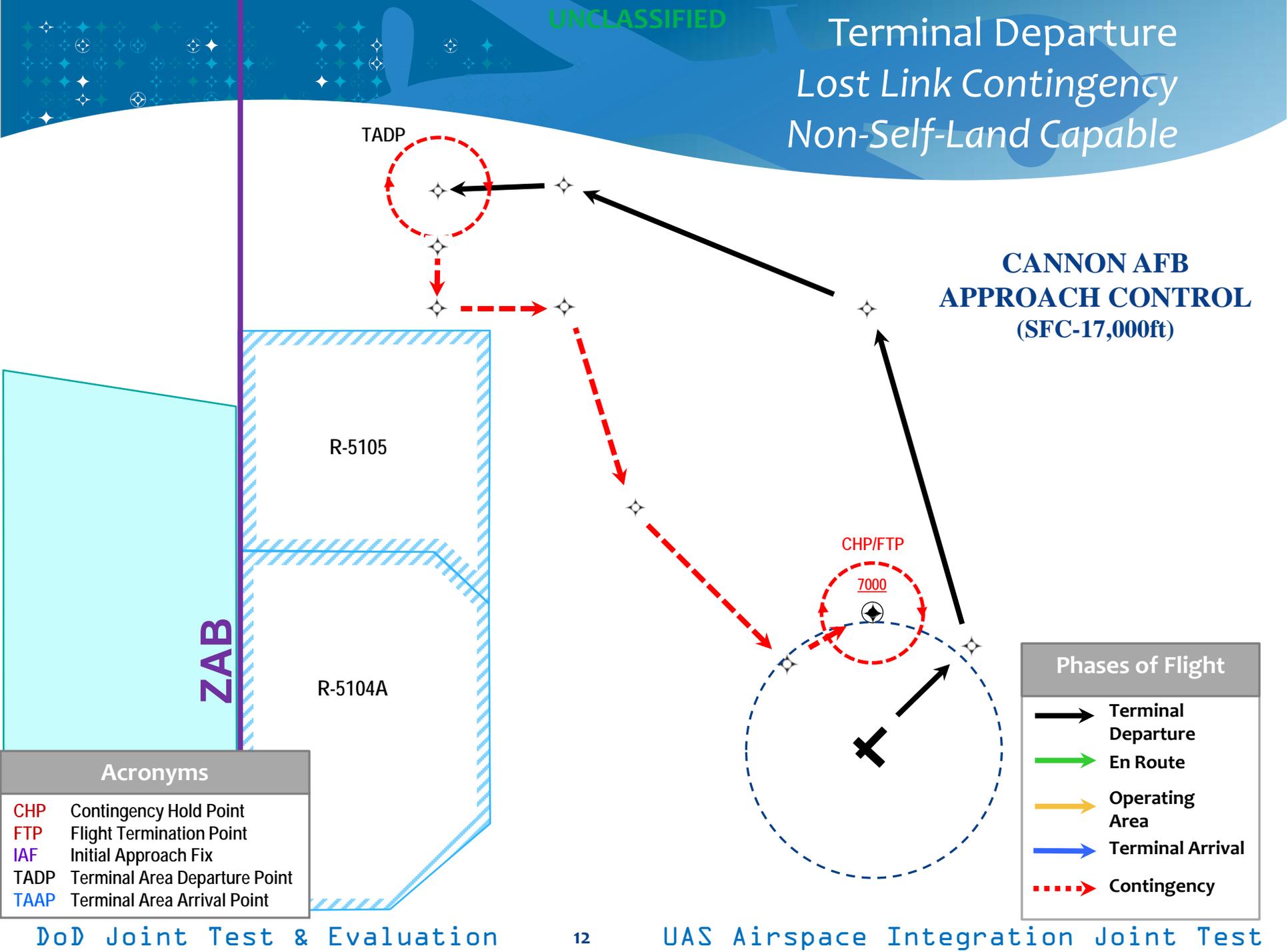
*Standardizes and aligns UAS routine and contingency procedures as much as possible to match manned aviation*



# Flight Plan Route



Terminal Departure  
Lost Link Contingency  
Non-Self-Land Capable



**CANNON AFB  
APPROACH CONTROL  
(SFC-17,000ft)**

TADP

R-5105

R-5104A

ZAB

CHP/FTP

7000

**Acronyms**

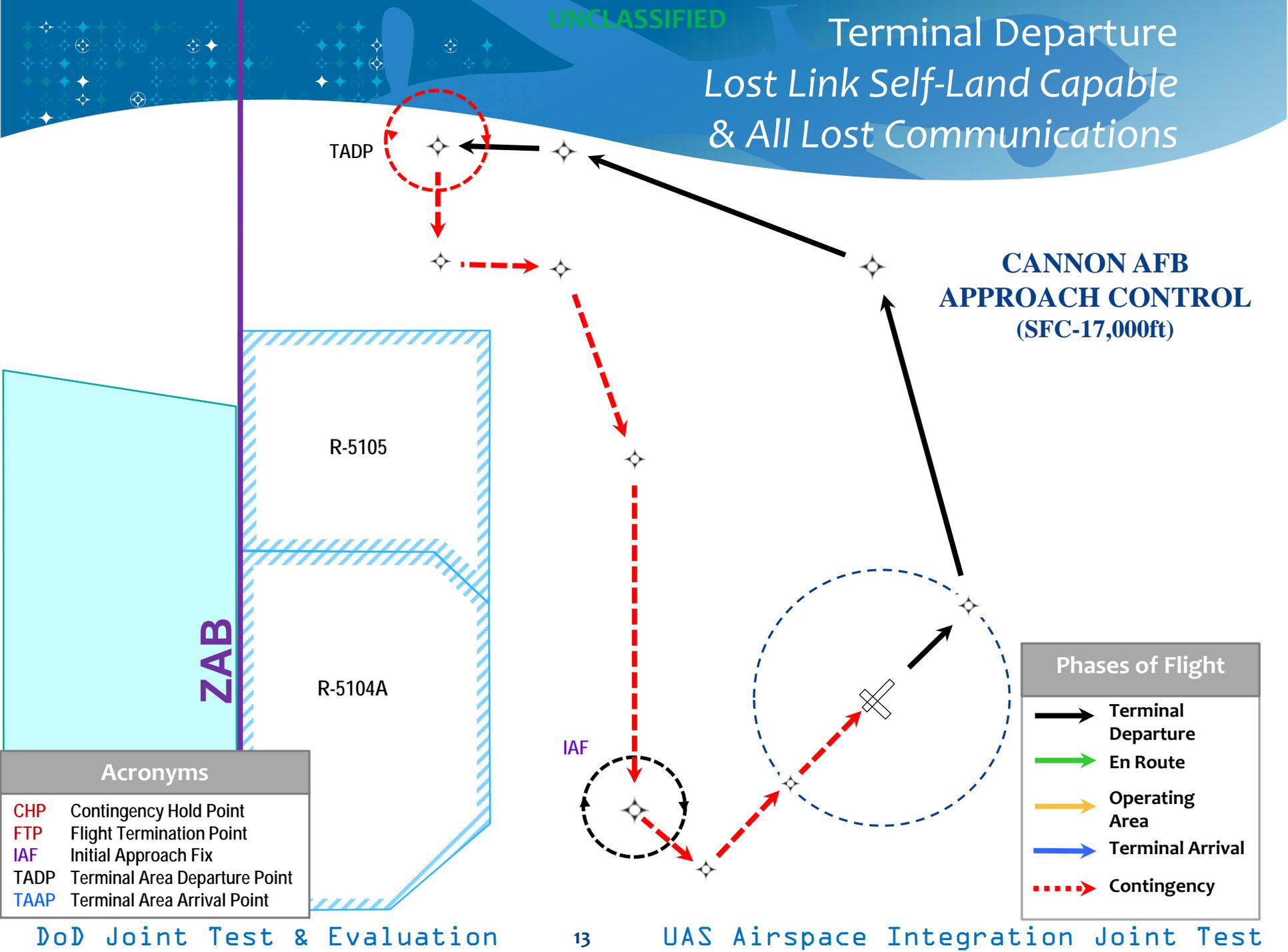
CHP	Contingency Hold Point
FTP	Flight Termination Point
IAF	Initial Approach Fix
TADP	Terminal Area Departure Point
TAAP	Terminal Area Arrival Point

**Phases of Flight**

	Terminal Departure
	En Route
	Operating Area
	Terminal Arrival
	Contingency

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Terminal Departure  
Lost Link Self-Land Capable  
& All Lost Communications



**CANNON AFB  
APPROACH CONTROL  
(SFC-17,000ft)**

TADP

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ZAB

Phases of Flight	
	Terminal Departure
	En Route
	Operating Area
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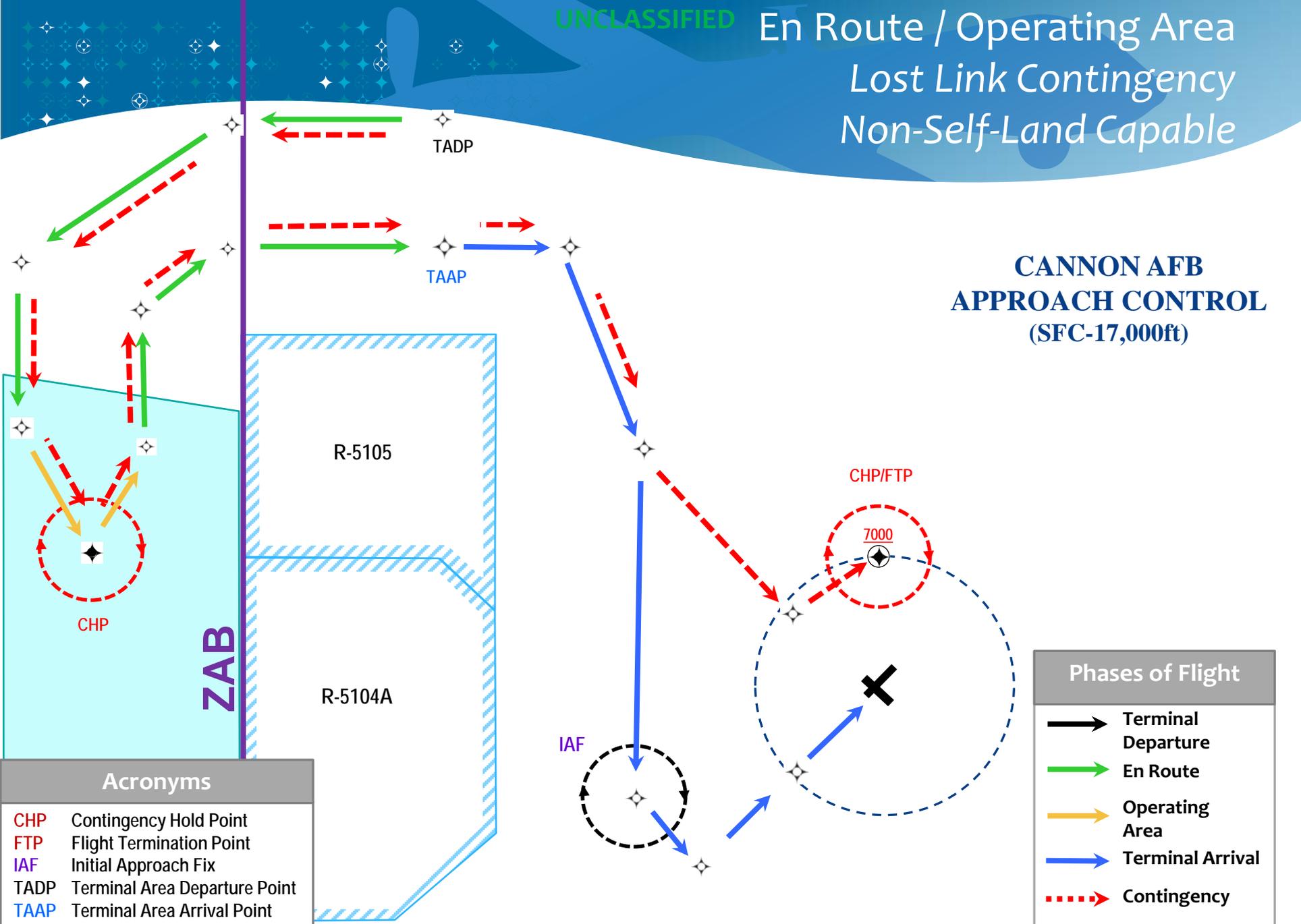
**Acronyms**

CHP	Contingency Hold Point
FTP	Flight Termination Point
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TADP	Terminal Area Departure Point
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En Route / Operating Area  
Lost Link Contingency  
Non-Self-Land Capable

### CANNON AFB APPROACH CONTROL (SFC-17,000ft)



#### Acronyms

CHP	Contingency Hold Point
FTP	Flight Termination Point
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TAAP	Terminal Area Arrival Point

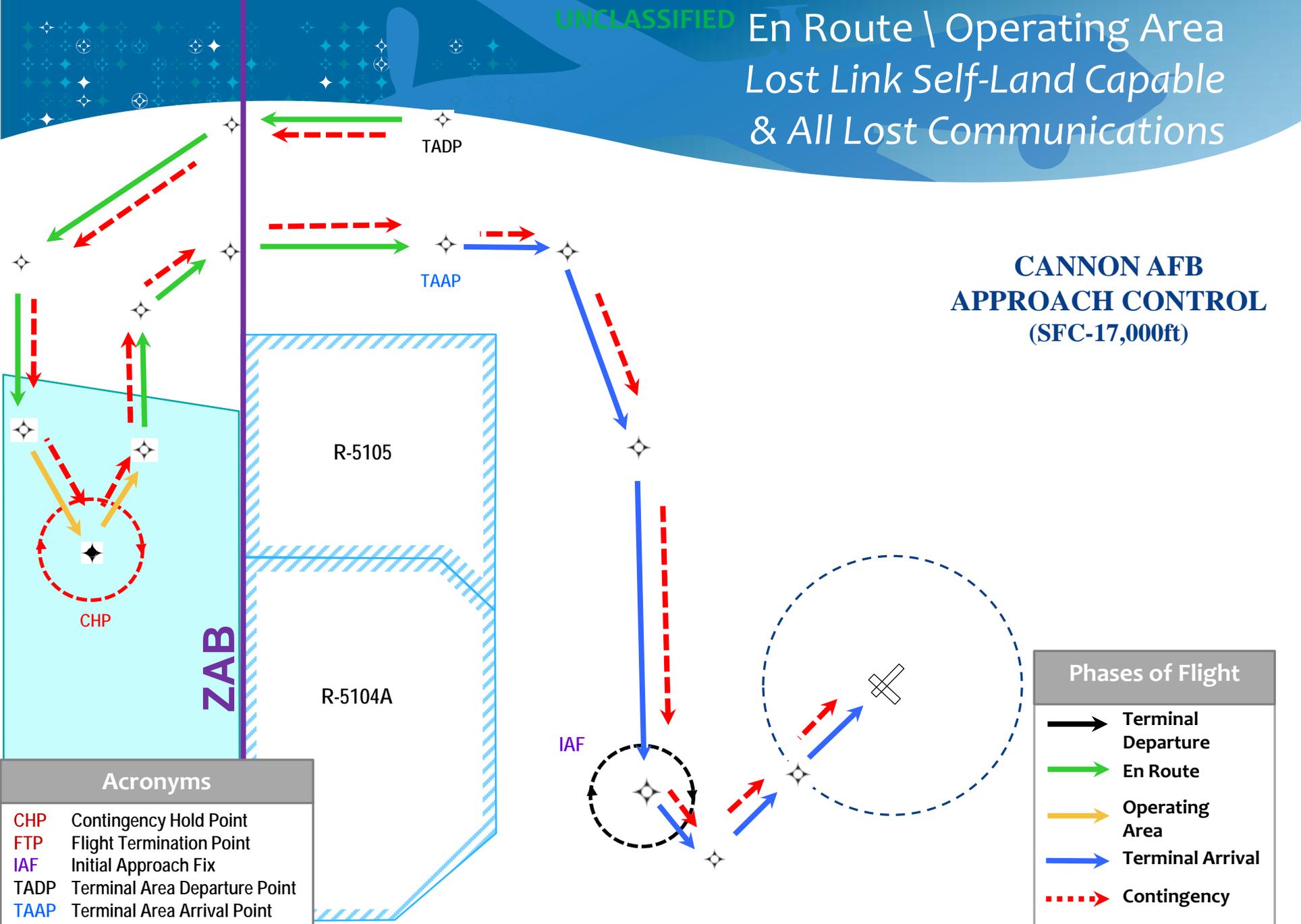
#### Phases of Flight

	Terminal Departure
	En Route
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	Terminal Arrival
	Contingency

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En Route \ Operating Area  
Lost Link Self-Land Capable  
& All Lost Communications

### CANNON AFB APPROACH CONTROL (SFC-17,000ft)



#### Acronyms

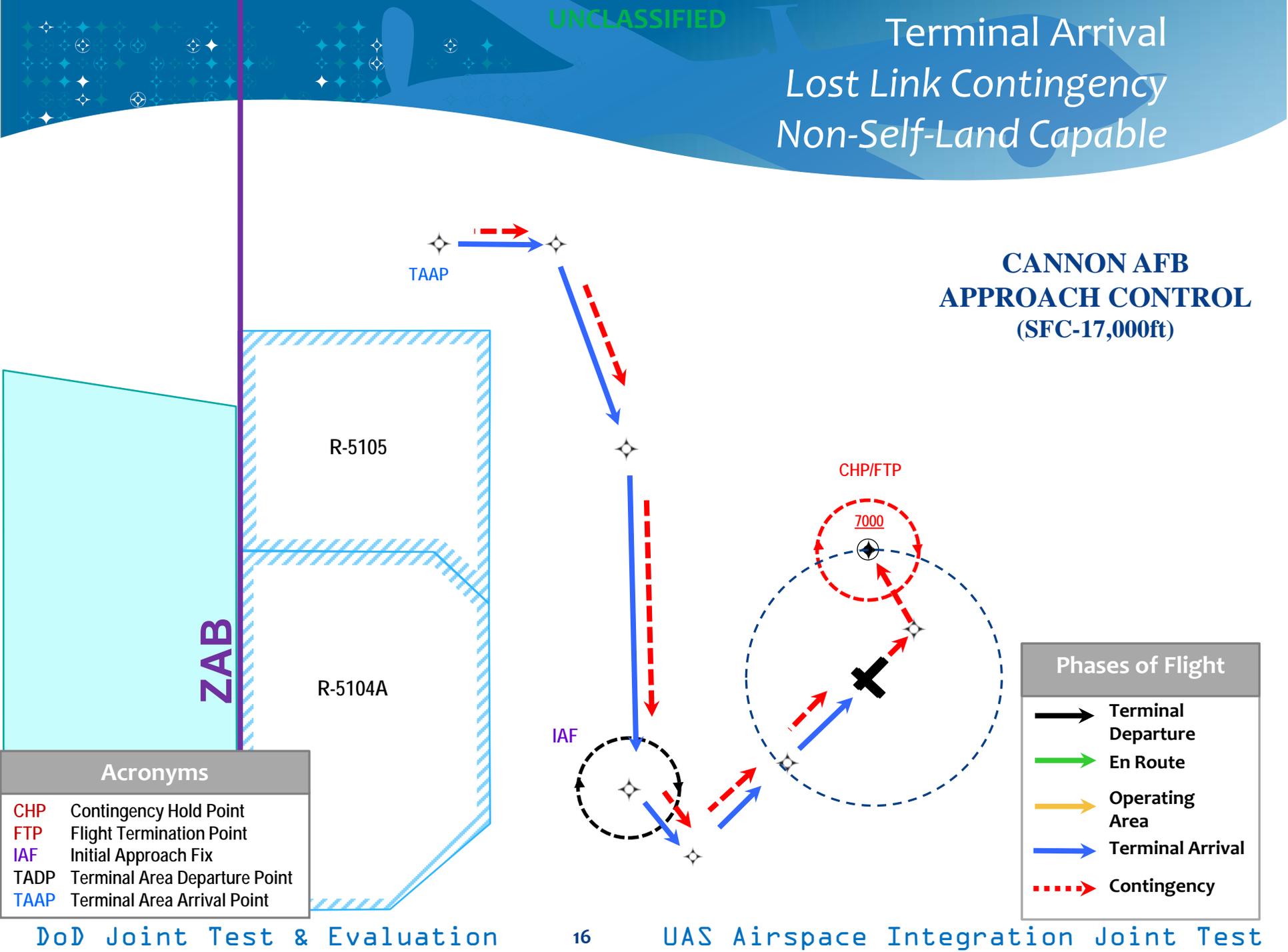
- CHP Contingency Hold Point
- FTP Flight Termination Point
- IAF Initial Approach Fix
- TADP Terminal Area Departure Point
- TAAP Terminal Area Arrival Point

#### Phases of Flight

- Terminal Departure
- En Route
- Operating Area
- Terminal Arrival
- Contingency

# Terminal Arrival Lost Link Contingency Non-Self-Land Capable

## CANNON AFB APPROACH CONTROL (SFC-17,000ft)



ZAB

R-5105

R-5104A

TAAP

IAF

CHP/FTP

7000

### Acronyms

CHP	Contingency Hold Point
FTP	Flight Termination Point
IAF	Initial Approach Fix
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TAAP	Terminal Area Arrival Point

### Phases of Flight

	Terminal Departure
	En Route
	Operating Area
	Terminal Arrival
	Contingency



# Types of UAS-Specific Charts

DOD approved UAS charts would provide:

- Increased safety
- Increased predictability
- Increased efficiency
- Illustrate routings, contingency fixes, and altitudes
- Graphically standardize UAS contingency procedures

Our solution was to develop UAS charts that mirror existing standards to the greatest extent possible:

- UAS Departure Procedures (UDP)
- Standard UAS Terminal Arrival (SUTA)
- UAS Approach Procedures (UAP)

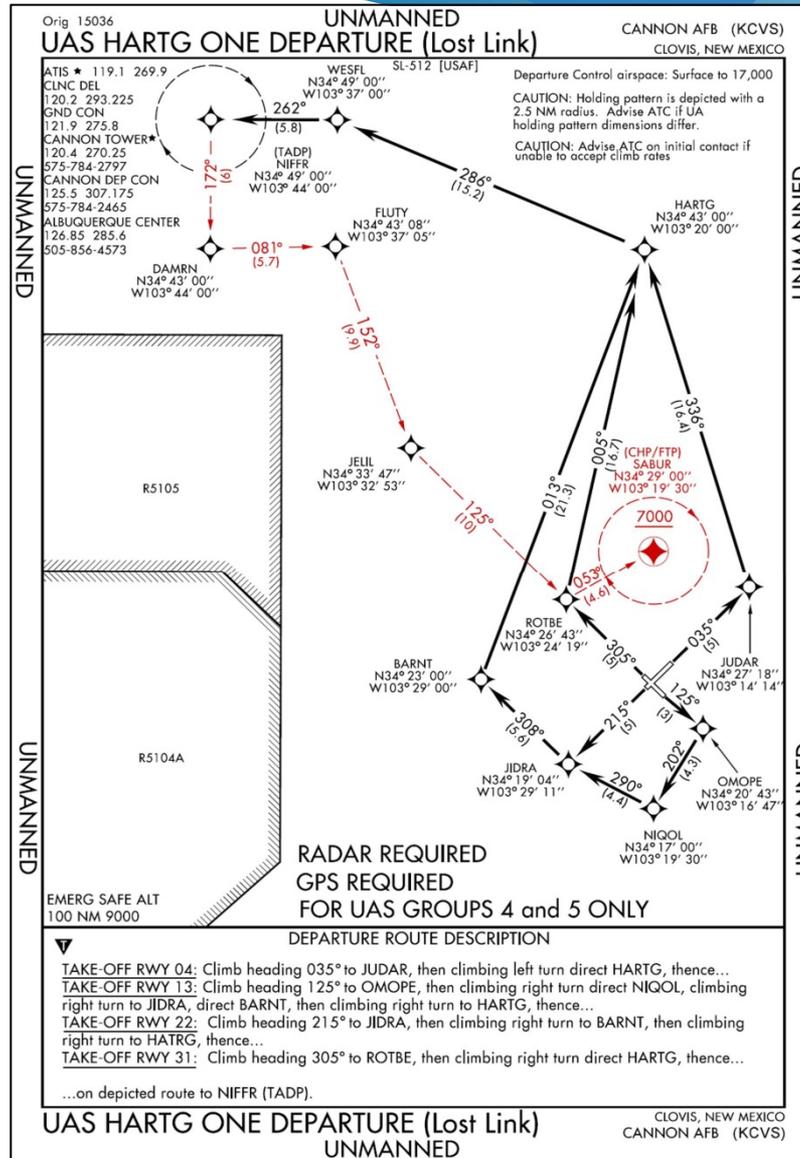
The following charts are a collaborative effort between UAS-AI JT and the NGA

# UAS Departure Procedure (UDP) Chart

(1 of 3)



Standard Instrument Departure (SID)-like



# UAS Departure Procedure (UDP) Chart

(2 of 3)



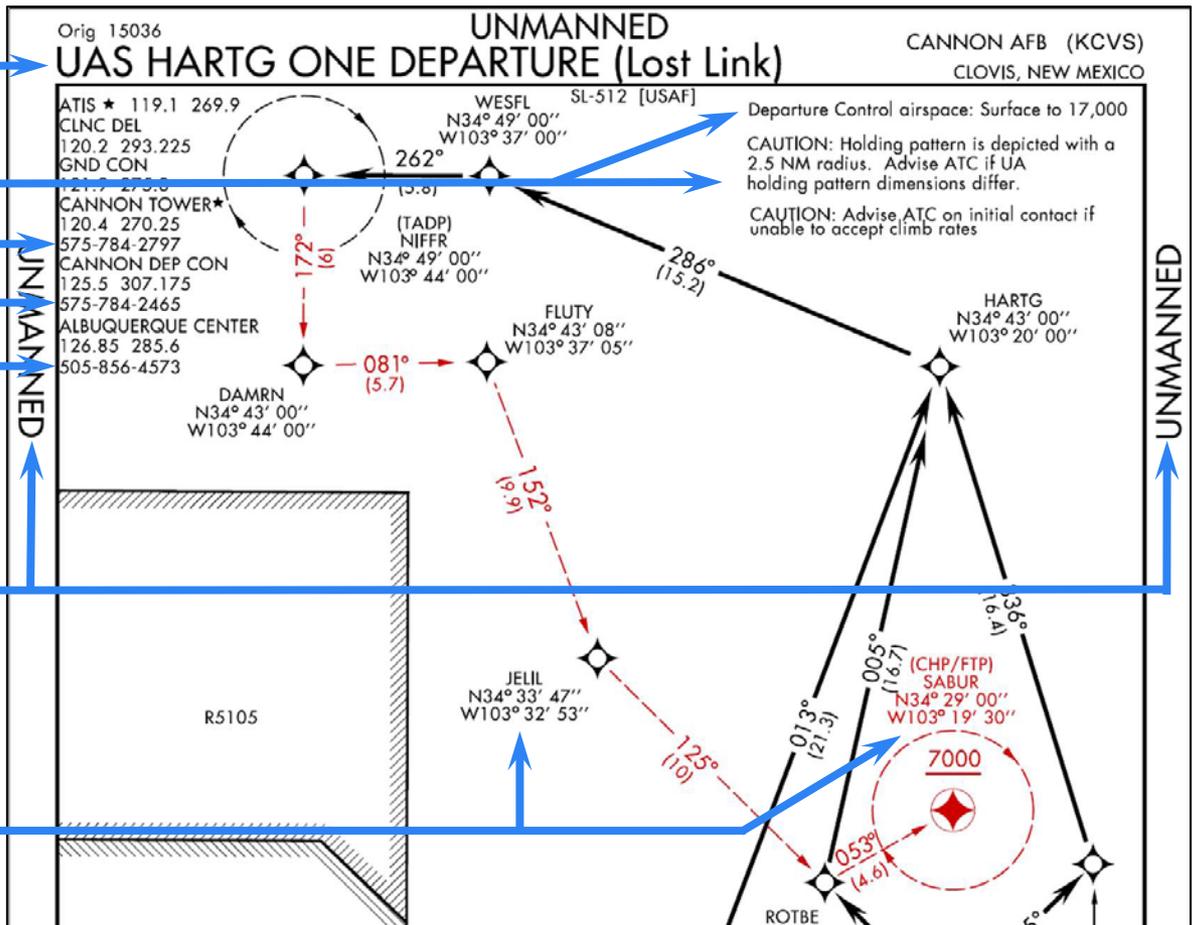
Added "UAS" to title of the UDP chart in the top margin

Added "Departure Control" airspace and applicable notes

Added applicable ATC facility phone numbers to ATC frequency information block for lost communications

Added "UNMANNED" to the margins; "UNMANNED" margin markings should be annotated on ALL UAS charts

Added waypoint information (waypoint type, name, and lat/long coordinates) for UAS mission planning



# UAS Departure Procedure (UDP) Chart

(3 of 3)



Charts should be depicted using color to highlight special use airspace and contingency routing

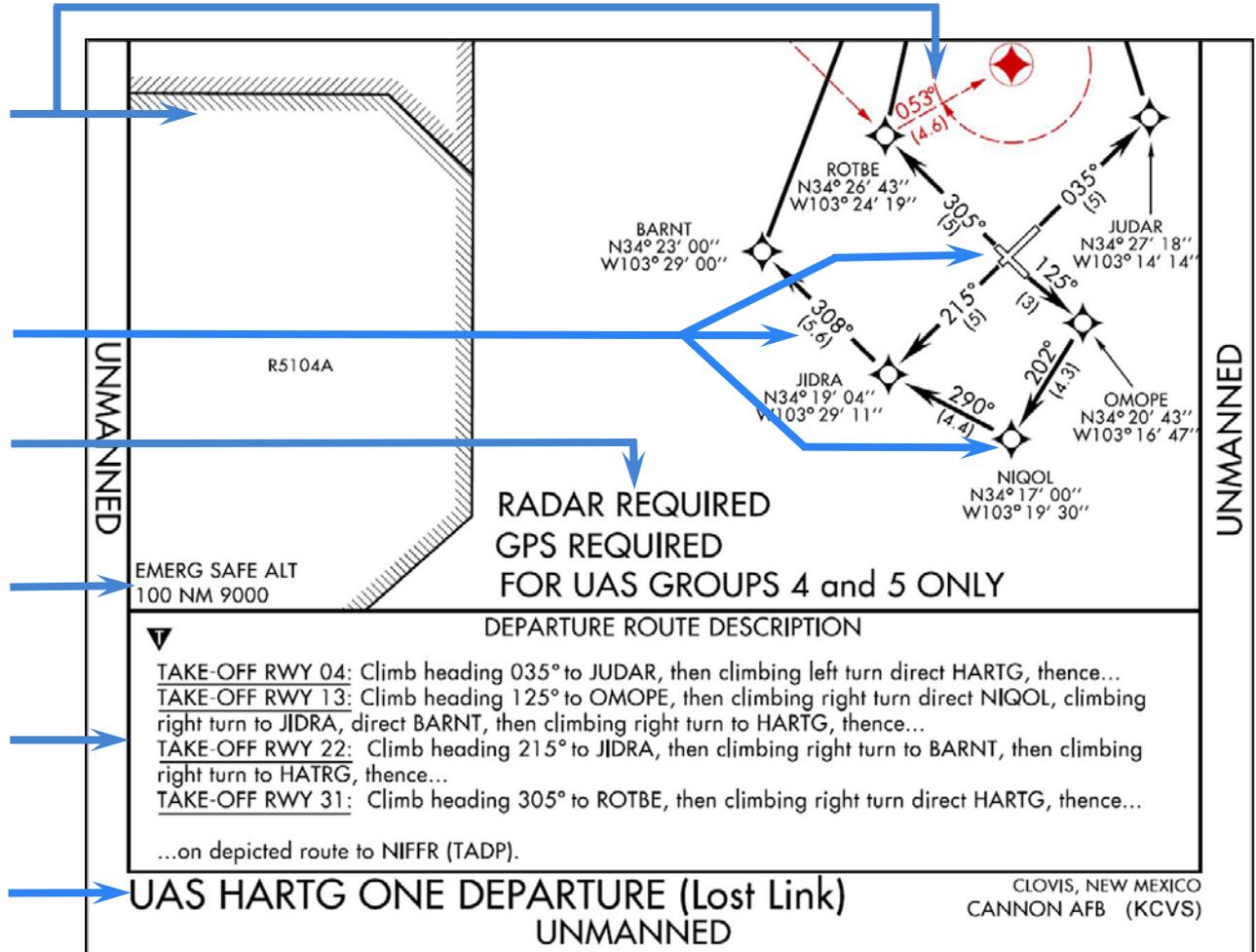
Used as many manned chart symbols and chart annotations as possible

Added ATC and UAS system requirements needed to use this UDP chart

Added Emergency Safe Altitude

Verbal depiction of departure routing, starts at runway and ends at the TADP; contingency routing would be on page 2

Added "UAS" to title in the bottom margin







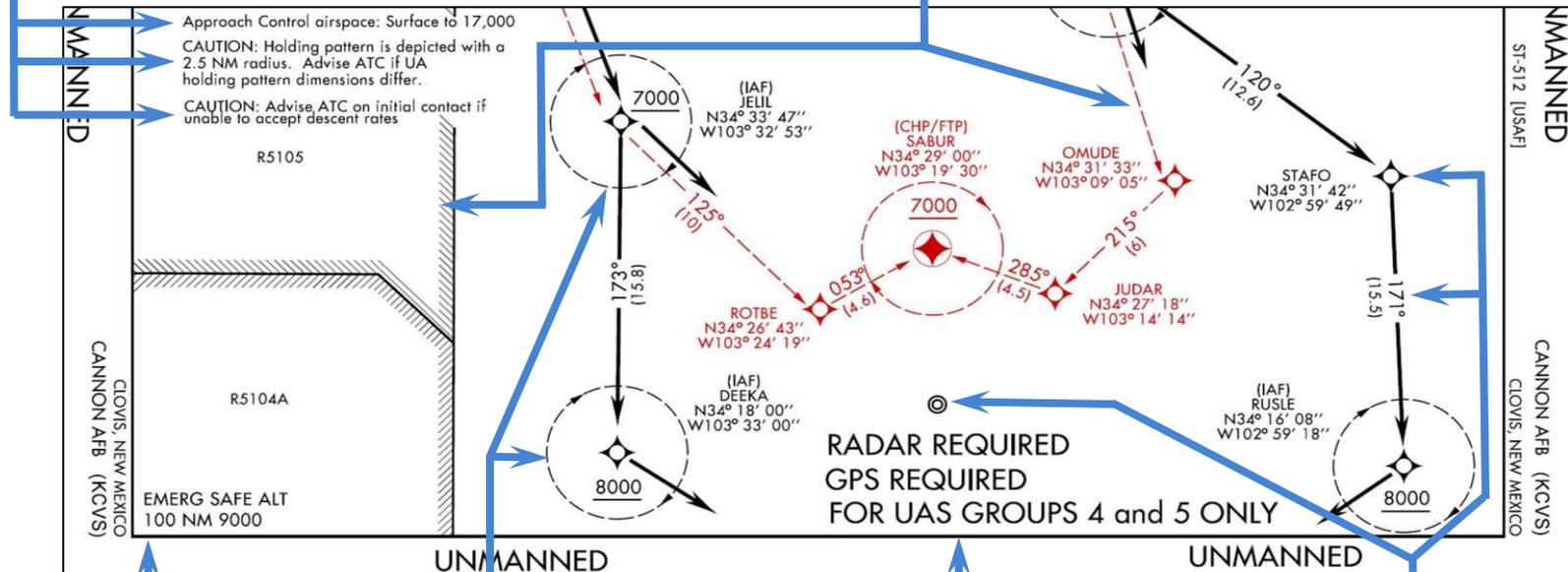
# Standard UAS Terminal Arrival (SUTA) Chart

(3 of 3)



Added "Approach Control" airspace and applicable chart notes

Charts should be depicted using color to highlight special use airspace and contingency routing



Added Emergency Safe Altitude

Holding Pattern depicted at all IAFs

Added ATC and UAS system requirements needed to use this SUTA chart

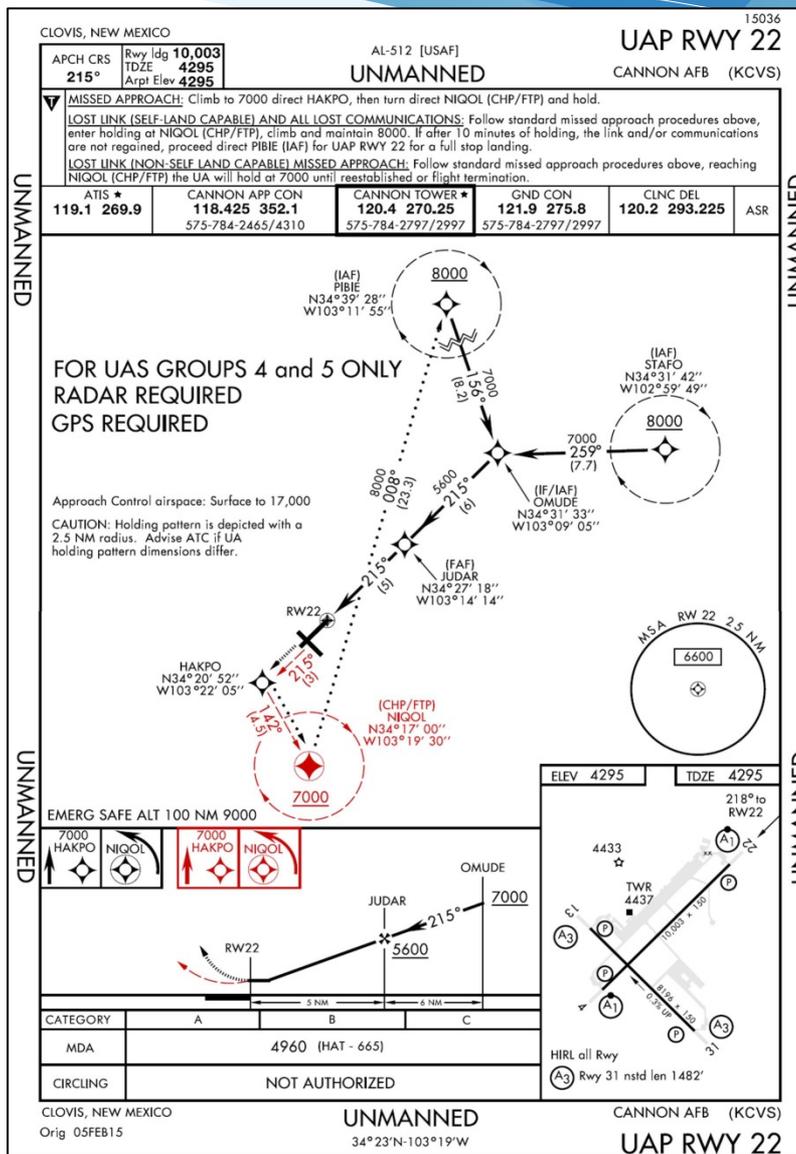
Used as many manned chart symbols and chart annotations as possible

# UAS Approach Procedure (UAP) Chart

(1 of 3)



GPS approach-like



# UAS Approach Procedure (UAP) Chart

(2 of 3)



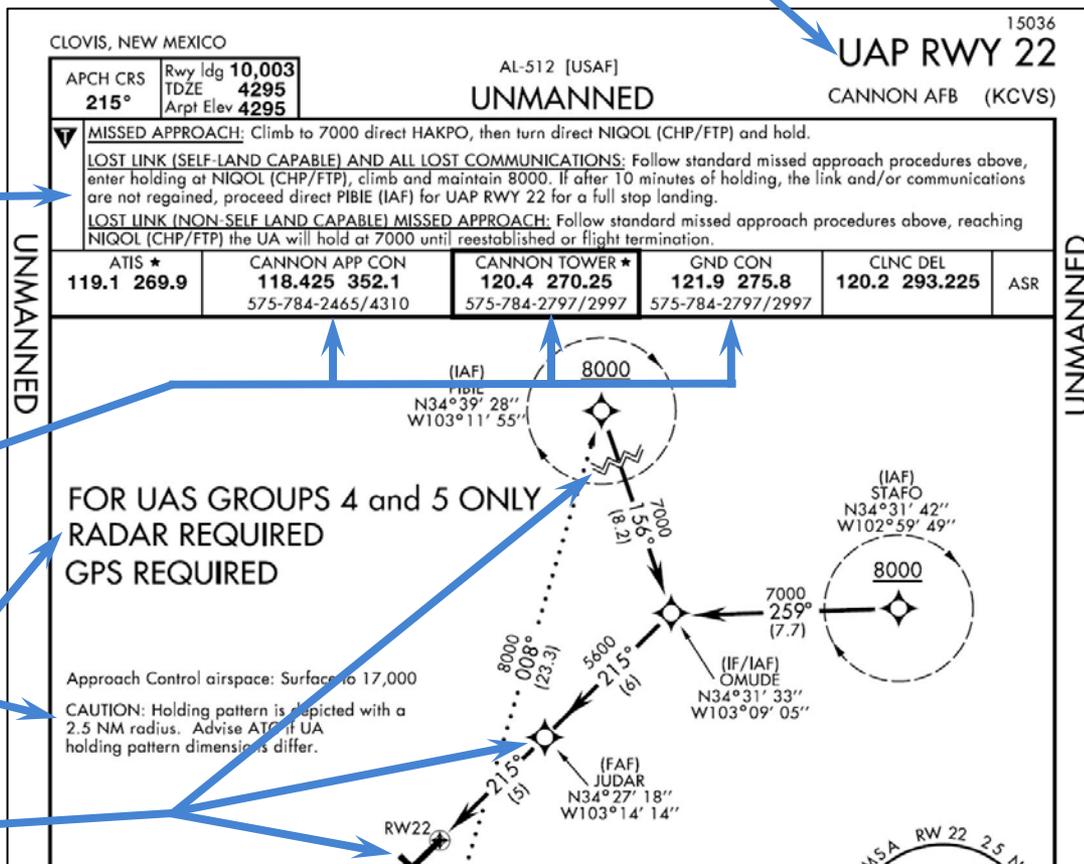
Added "UAP" to title of the chart in the top margin

Added Lost Link and Lost Communications contingency procedures to Missed Approach instructions

Added phone numbers to Approach Control, Tower, and Ground Control frequency blocks for lost communications

Added ATC and UAS system requirements needed to use this UAP chart

Used as many manned chart symbols and chart annotations as possible



# UAS Approach Procedure (UAP) Chart

(3 of 3)

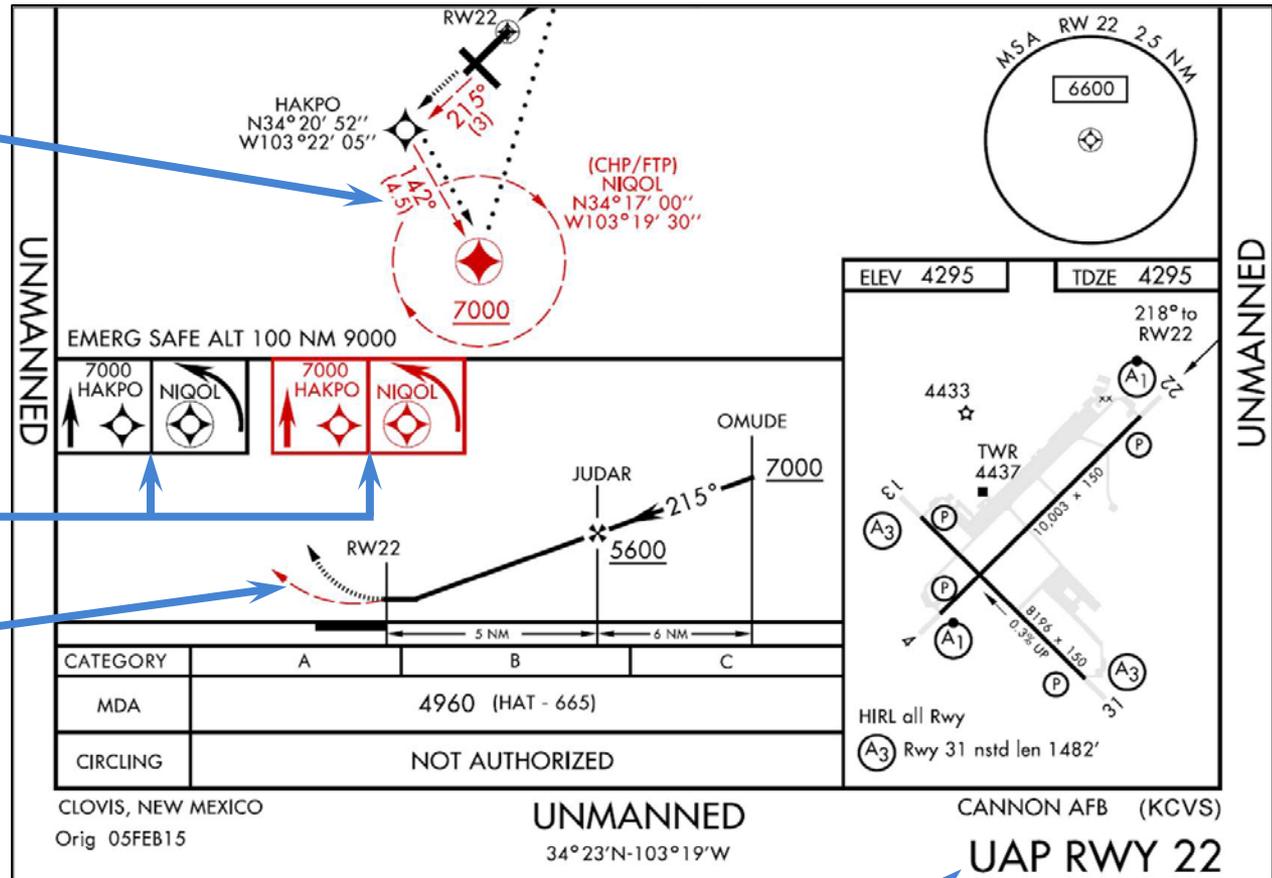


Used the color red for all lines and text of the contingency routing

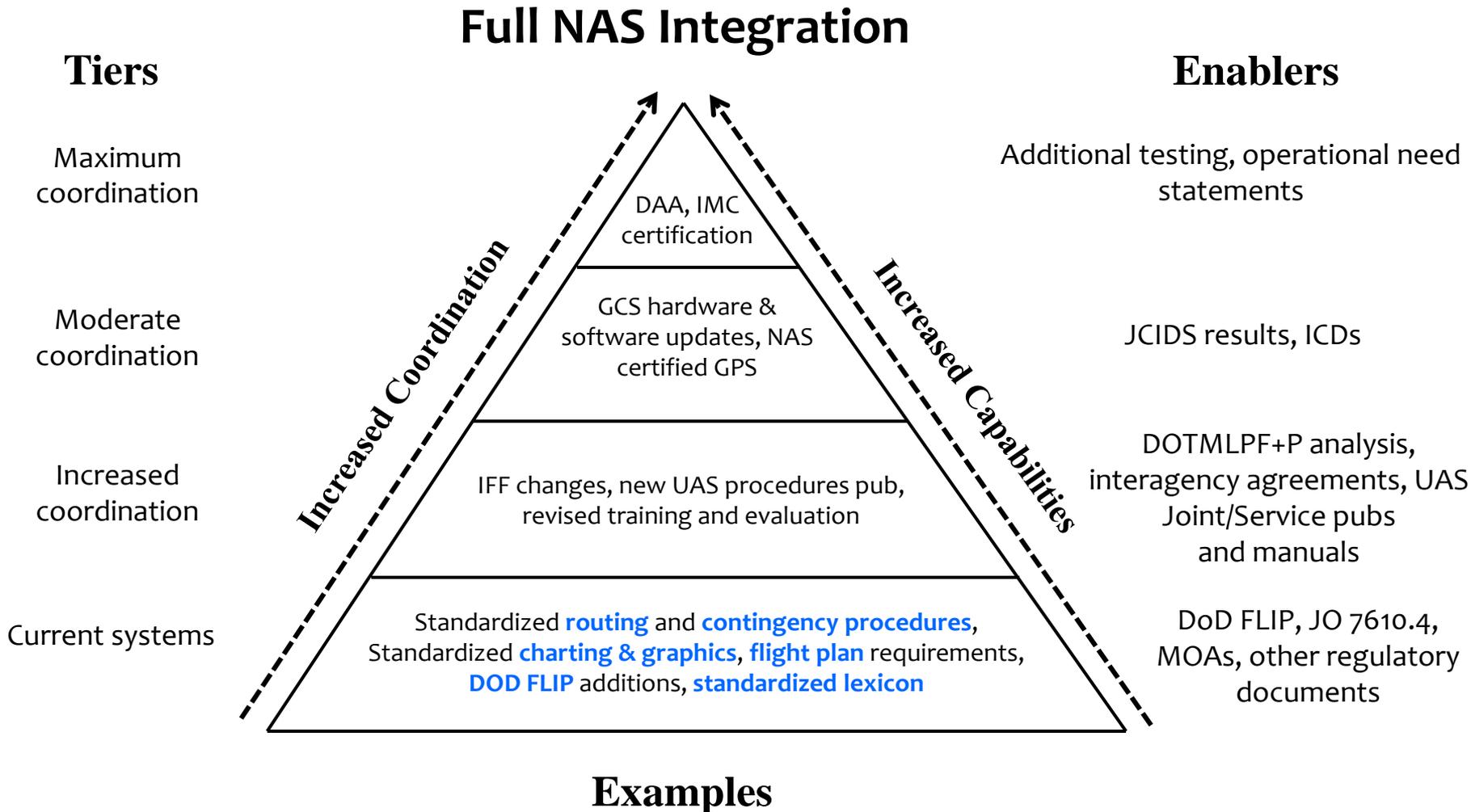
Added contingency missed approach routing to profile view; standardized: regular missed approach in top left corner and contingency missed approach in top right corner

Added contingency missed approach arrow to profile view

Added "UAP" to title of the chart in the bottom margin



# Tiered Approach Concept



# Questions?