



CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT (CAASD)

# The Role of No Radio (NORDO) Events in Airspace Security



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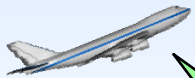


# It Began As A Normal Flight...

**08:27 AM**

Suspicious transmission heard...

Sudden deviation initiated from flight path



Departed  
Climbing to assigned altitude

Routinely acknowledged  
ATC communications

Cleared to FL350  
Not acknowledged!  
Attempts to contact unsuccessful!

Stopped responding  
with beacon returns  
Transponder turned off?

AM...O



## It Began As A Normal Flight...

The date was September 11th, 2001

The flight was American 11

It had been hijacked by terrorists

**08:46 AM**



The *very first indicator* to the ATC system  
that something was amiss  
was this NORDO event

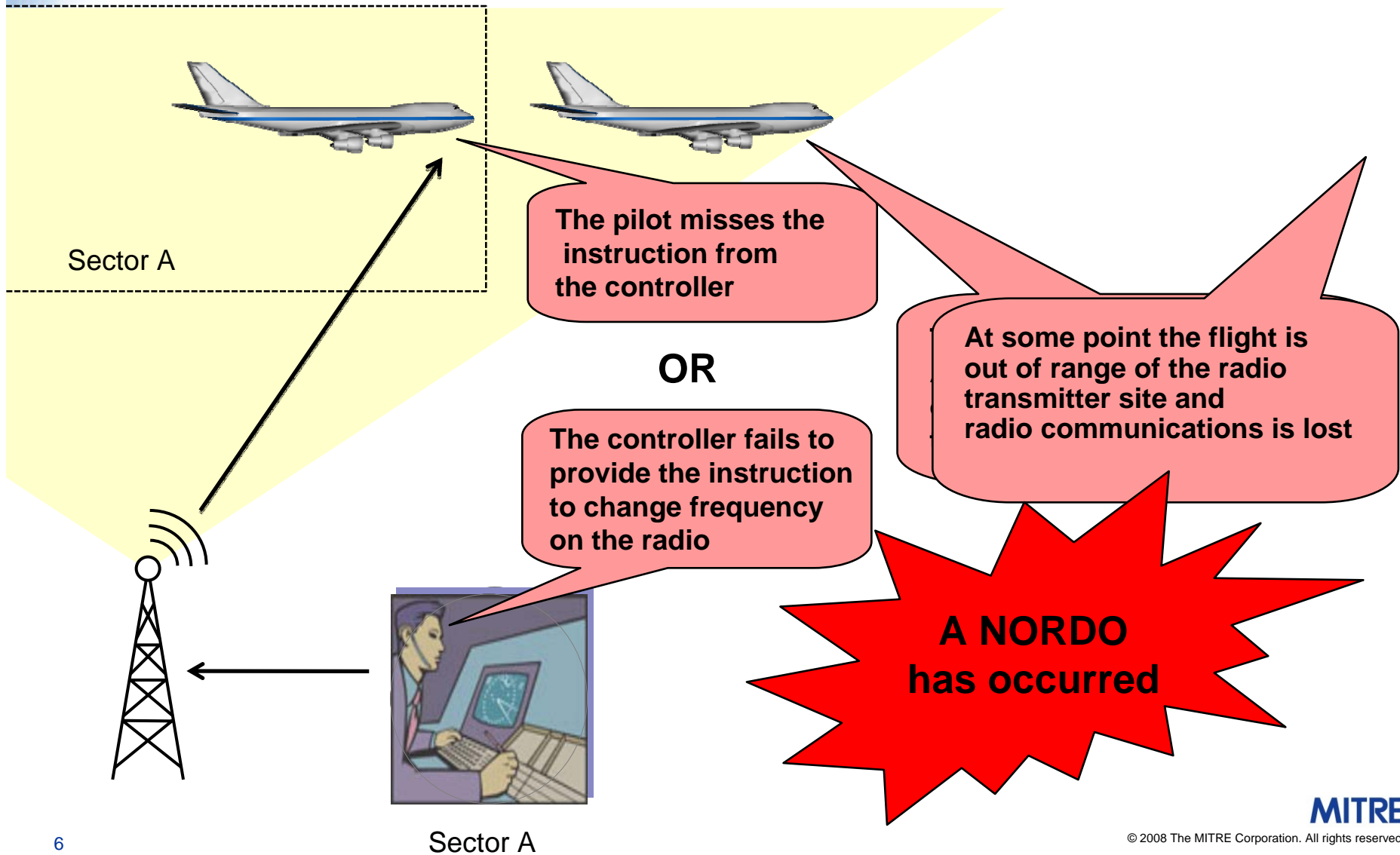


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# SEVERAL COMMON NORDO SCENARIOS

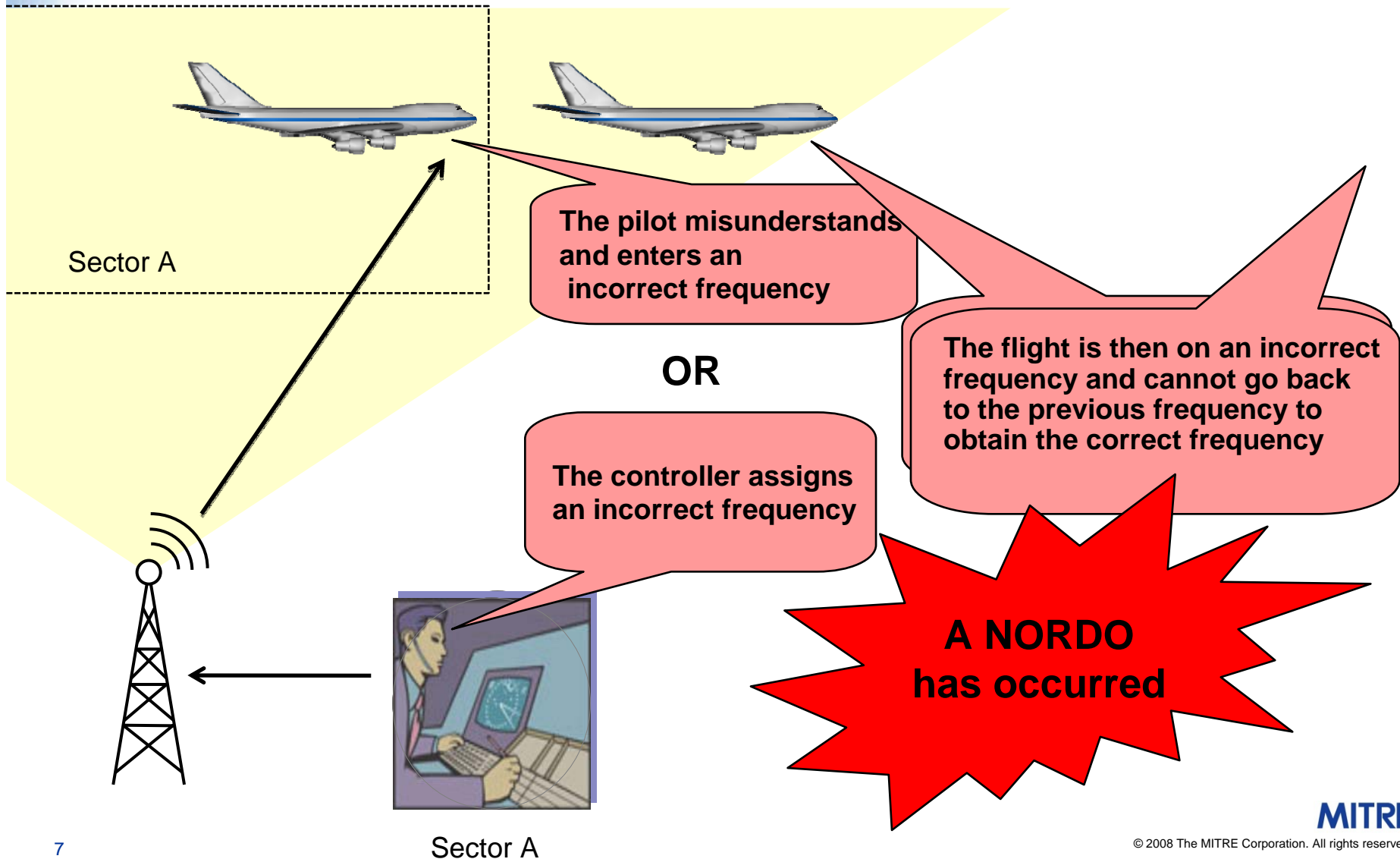


# Example NORDO Scenario: The Flight Stays on the Old Frequency





# Example NORDO Scenario: The Flight Changes to an Incorrect Frequency





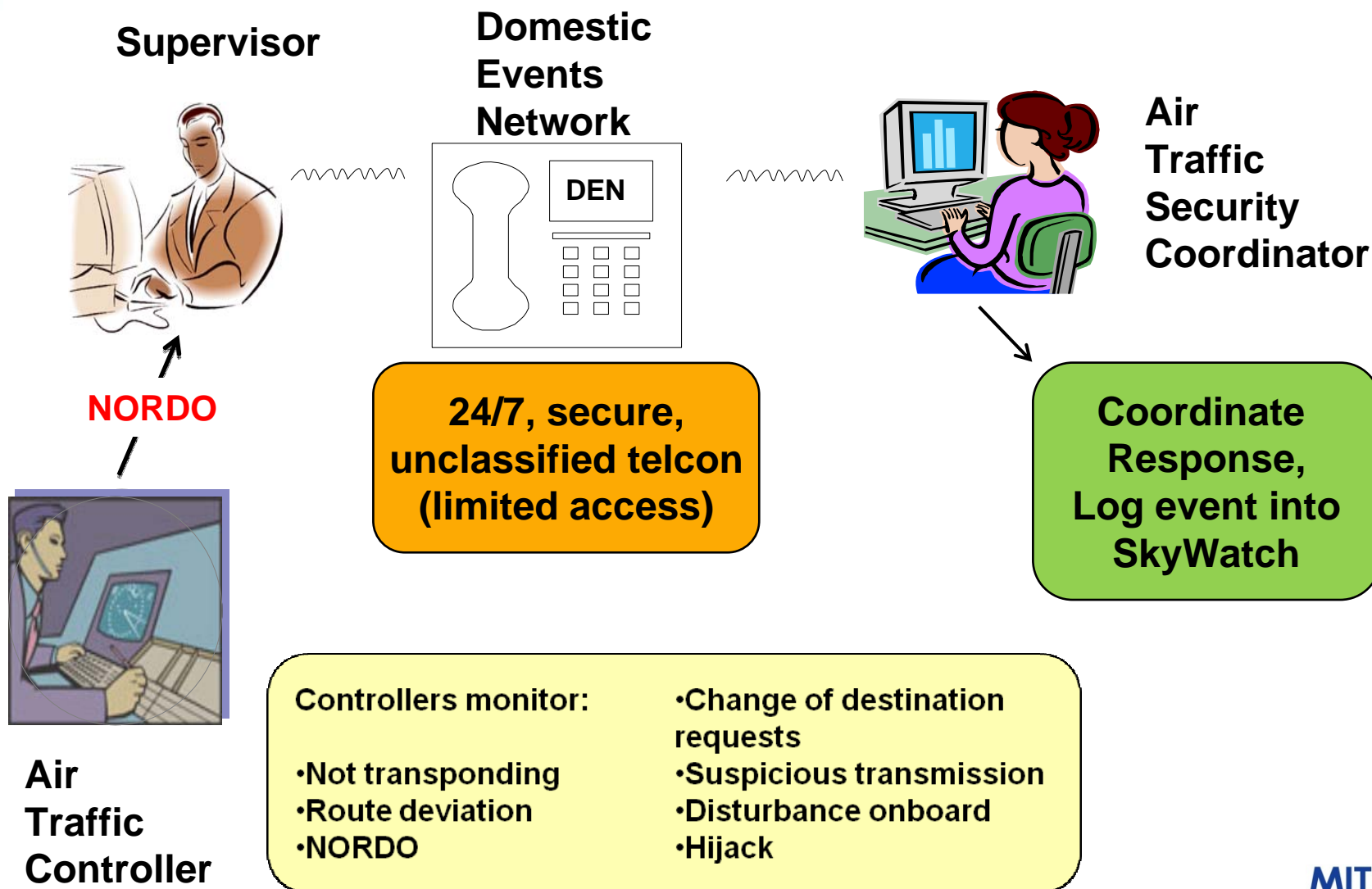
## NORDOs are Fairly Common

- But, a NORDO might be an early indicator of a hijack

Month	Days	Mean	Max	Min
January	17	11.0	18	6
February	28	9.5	15	4
March	31	10.8	16	6
April	30	10.1	25	4
May	31	11.3	26	3
June	30	11.2	20	3
July	31	8.1	12	1
August	24	9.4	16	4
<b>Total</b>	<b>222</b>	<b>10.2</b>	<b>26</b>	<b>1</b>



# Reporting A NORDO





# SkyWatch Data

- **SkyWatch Data examined**
  - From 15 January 2007 through 24 August 2007
- **SkyWatch supports many fields for logging including:**
  - Time stamps
  - User Id (person logging the NORDO)
  - Reporting facility
  - Remarks – a free text description of the event
- **Flight specific information**
  - Operator type
  - Operator name (if a commercial carrier)
  - Call sign
  - Aircraft type/Tail number
  - Origin/Destination airport
  - Location of flight

**Note:** Due to the sensitive nature of some of the information contained in SkyWatch, in some cases the SkyWatch data presented in this paper/presentation has been redacted.



## Example Remarks Fields for NORDO Events

- **Several examples of “routine” NORDOs**
  - “Communications reestablished at 2338.”
  - “Back on frequency at 0820Z.”
  - “Comm reestablished at 1634.”
  - “Comms returned at 1632.”
  - “On course at assigned altitude. 0759: Comm reestablished.”
- **Several examples of “non-routine” NORDOs**
  - “Aircraft out of communication with ZAB for 40 minutes. 0900: ZHU can hear the aircraft calling, but cannot establish 2 way comms. 0916: Aircraft in communications with ZHU, in descent for landing.”
  - “Aircraft appears to have electrical problems, transponder is also gone. At 0330Z, primary target disappeared, aircraft may have landed at small airport. 0401Z, confirmation that aircraft landed without incident.”
  - “At 2203 XXX at runway alert. Comms reestablished at 2204. XXX standing down.”



# Challenges & Analysis Questions

ICNS  
CONFERENCE

- **Challenges**

- How to differentiate between the vast majority of loss of communication events due to reasons other than an attempt to take unauthorized control of an aircraft from those that are?
  - This is the classic “needle in the haystack” problem
- How to stay vigilant for the true hijack situation when the vast majority of situations are not security incidents?
  - This is the classic “crying wolf” parable

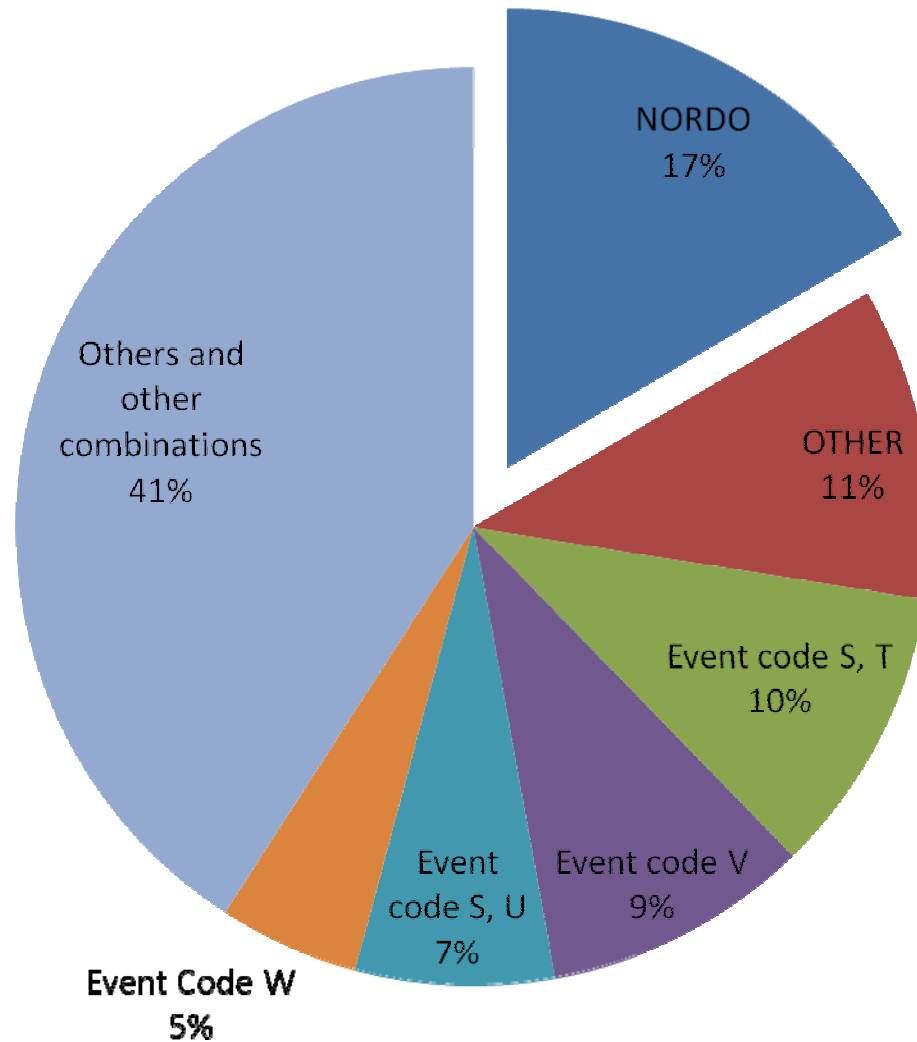
- **Analysis Questions to gain insight into NORDOs**

- What is the overall percentage of NORDO events logged relative to other logged events types?
- What types of flights have NORDOs?
- What is the rate of NORDOs relative to flight operations?
- Did the NORDO event occur for a flight that had interest from a security perspective due to the nature of the flight?
- Were any prior and/or subsequent security events associated with the flight?



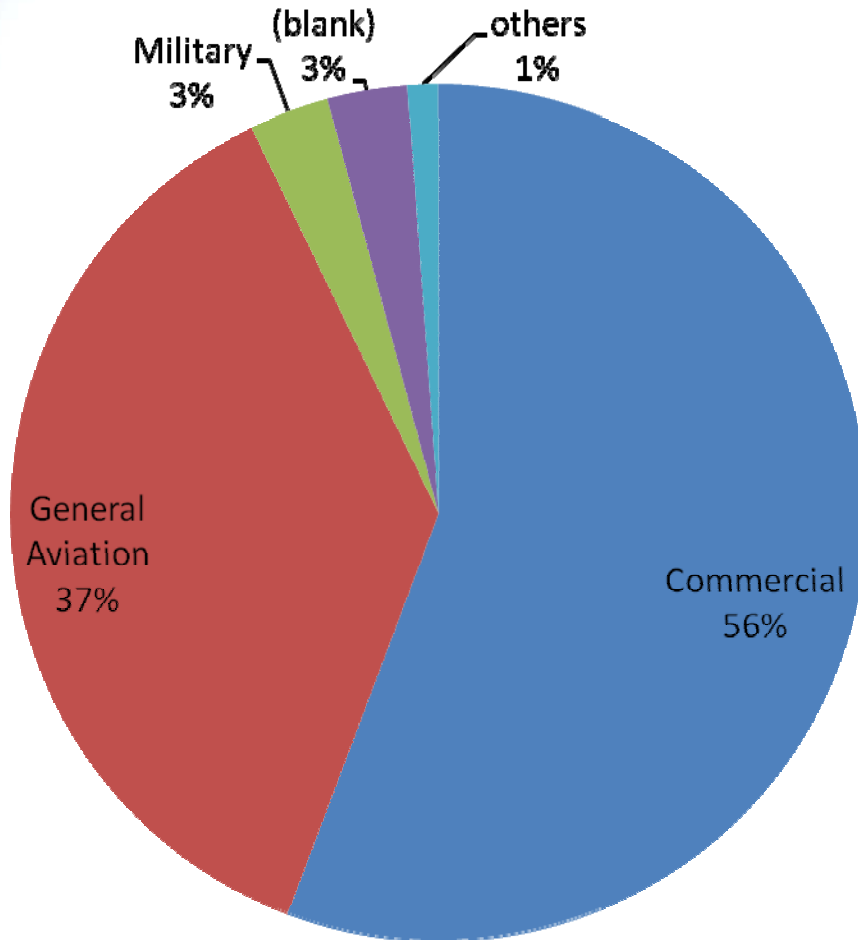
# NORDOs are the Most Frequent Event Code Logged in SkyWatch

## Percentage of NORDOs by Event Code

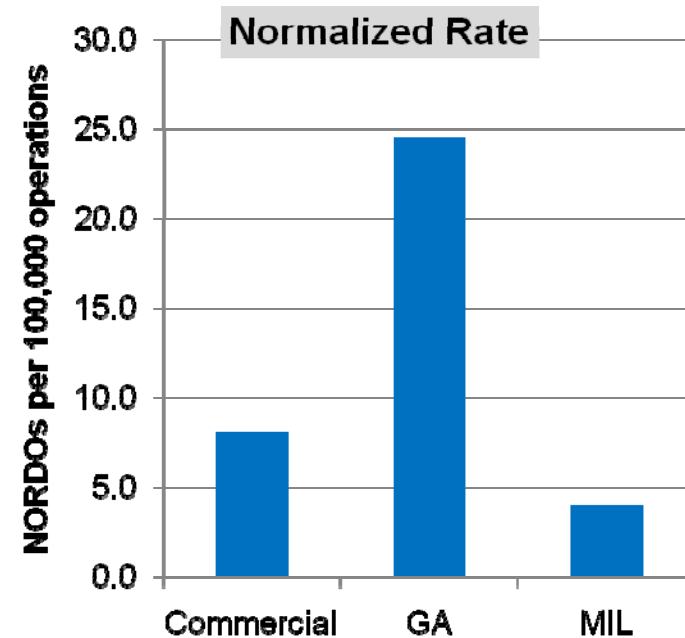




# Most NORDOs for Commercial Flights, Highest Rate for GA



Percentage of NORDOs by Operation Type

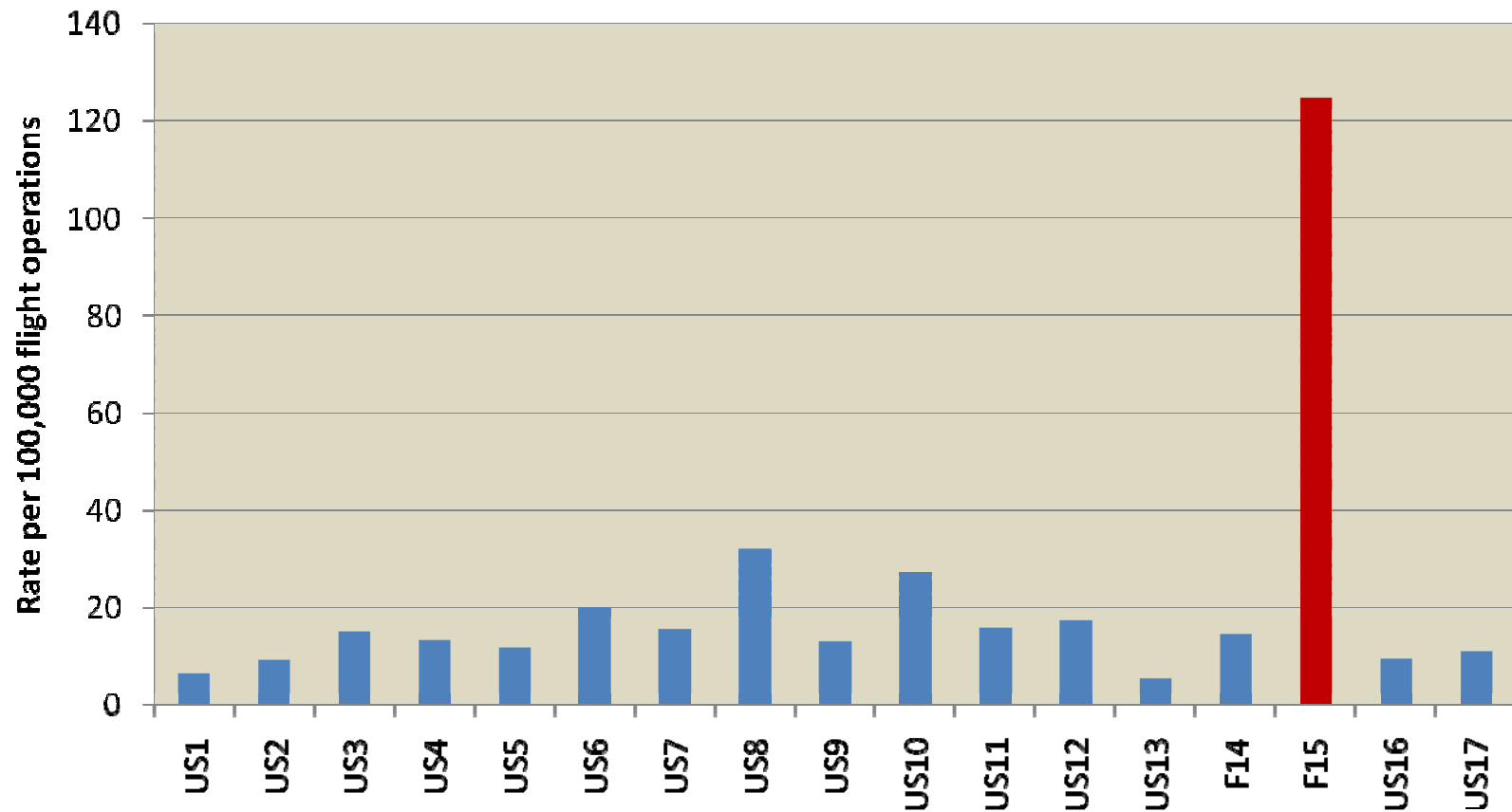


Rate of NORDOs per Flight Operation



# One Commercial Operator had a High Rate of NORDOs

Rate of NORDOs per Commercial Operator

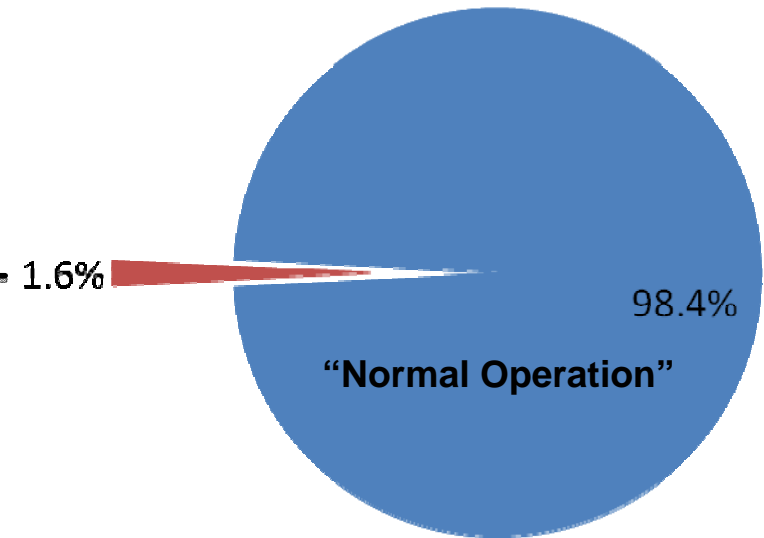


The names are coded by US or foreign flag operators (i.e., “US” or “F”) and are ranked by the number of NORDO events logged .



## NORDOs for Flights with an “Interest from a Security Perspective”

- **Flight of Interest & NORDO:**
  - Diplomatic clearance
  - Operated by foreign state government
  - Special Interest Flights
- **NORDO & Change of Destination**
- **NORDO & Track of Interest**
  - Violates security airspace
- **NORDO & other events**
  - Disturbance onboard or suspected hijack ...



Percentage of NORDOs



## Findings

- **Relatively small number of NORDO events**
- **NORDOs are one of the most frequently reported security related events**
- **NORDOs occur during all types of operations**
- **The rate of NORDOs varies by commercial operator**
- **Less than 2% of NORDOs occurred on flights that were already of “interest from a security perspective”**



## Conclusions

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- **The true nature of a NORDO is usually not definitively known until the event is resolved**
- **Each and every NORDO event could be an indicator of an unauthorized takeover of an aircraft while in flight**
  - **Fortunately, there are a relatively small number of NORDOs**
- **All NORDO events must be monitored and evaluated until a hijack (or other security related event) has been ruled out**
  - **Any initiative to reduce the number of NORDOs reduces the number monitored and evaluated**



## Possible Future Area to Investigate

- **Implications of NEXGEN on NORDOs**
  - May reduce overall number of NORDOs
- **Risk-based approach – assess risk of each event and adjust monitoring, evaluation and response appropriately for those events having higher risk**
  - **Several factors to consider**
    - Duration of the NORDO
    - Location of the NORDO flight
    - Type of aircraft



# Questions?