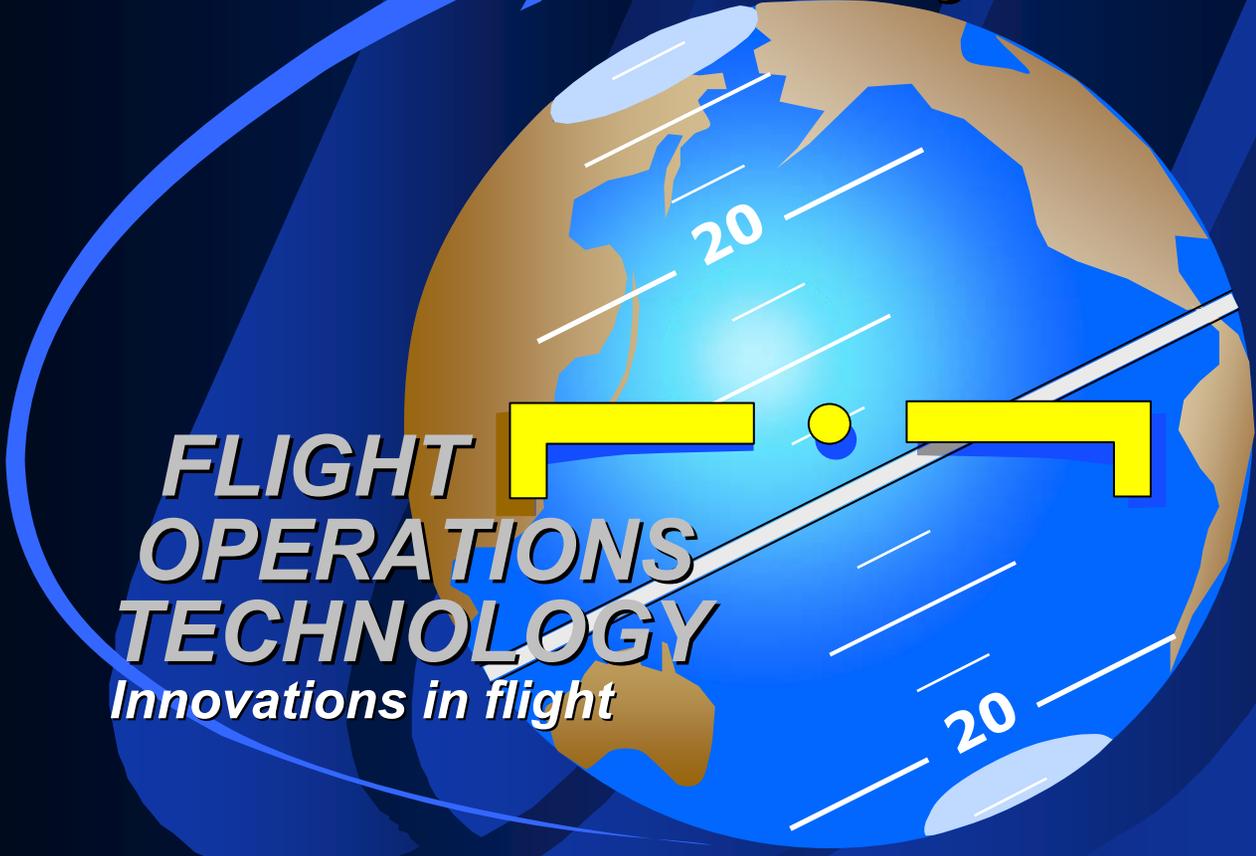


Airline Implementation of Cockpit Weather Systems



**FLIGHT
OPERATIONS
TECHNOLOGY**
Innovations in flight

Capt. David Sambrano
Flight Technical Manager

Background UAL ISE

- Just finished 40+ segments on A320 In-Service Evaluation
- Tested products of WINN program included:
 - CONUS Radar*
 - Worldwide Satellite*
 - Convection*
 - Nowcasting
 - Airports (METARS/TAFS)
 - Turbulence Forecast

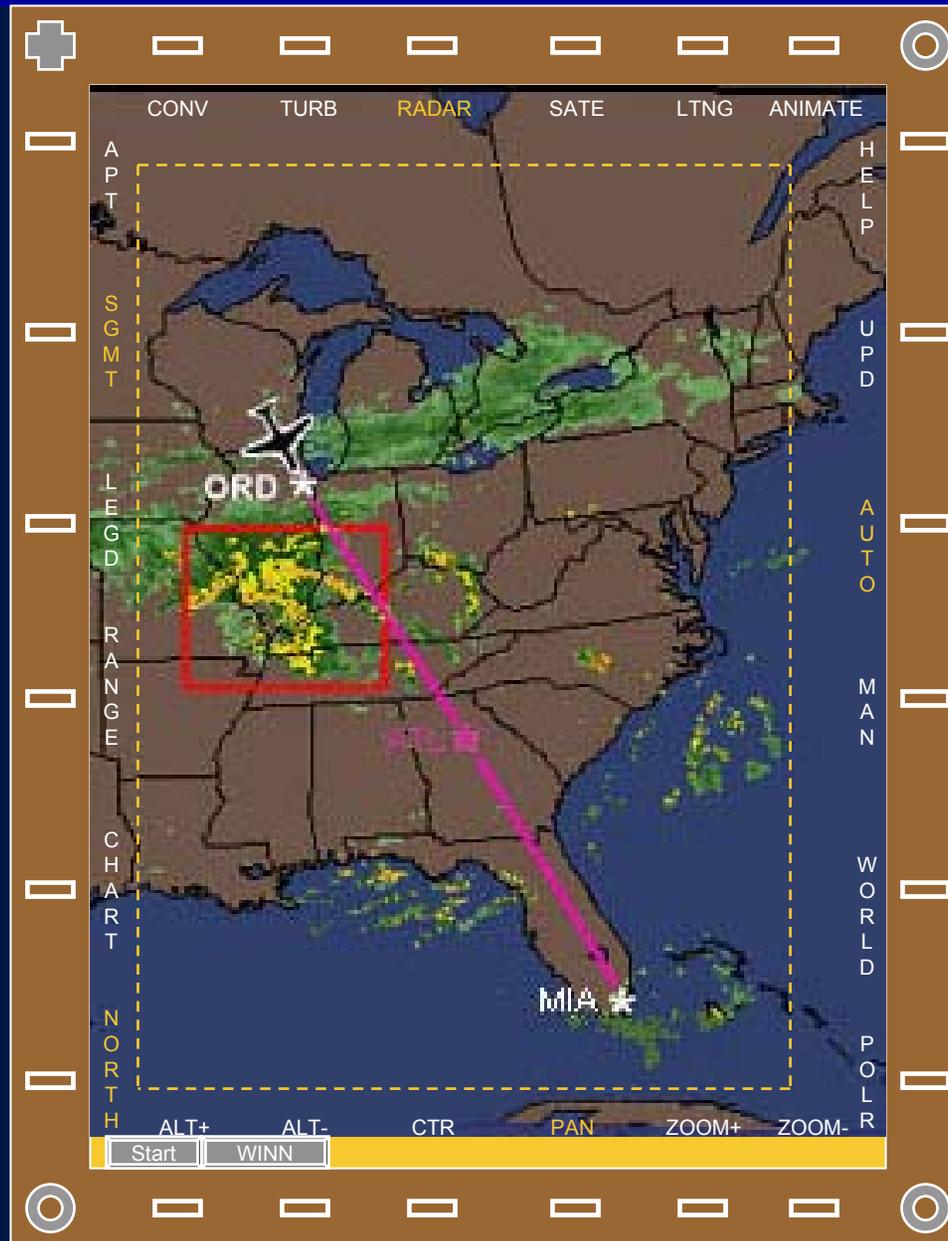


Weather Information Network (WINN)

SIGMET, METARS, TAF, and airport ATIS information may be displayed in a graphic format and in text

The FMC's flight plan route is automatically displayed

Data is displayed in a "North up" format or in a "Track up" format



Covective, Volcanic Ash, Turbulence, Winds, Icing, Radar (conus only), Satellite, Lightning, and "Nowcasting" weather data are available world wide via automatic data link

Provides quality information for making better decisions

Enhances pilots' situational awareness

The WINN program automatically centers and tracks the aircraft's location or by manually panning to any location

FLIGHT OPERATIONS TECHNOLOGY
Innovations in flight

ISE Results

- Real time radar images.
- Turbulence predictions were accurate.
- Coded airport very effective in divert decision.
 - METAR Wx table format very good.
- SAT imagery results.
- Graphical Sigmets good.



METAR Table Format

LOC A/THR EXP
AOC BEGIN 01/04/16
HRLY WEATHER
UA1464 DENMSY
MSY 1857 161853Z
01006KT 10SM FEW025
26/18 A3008 RMK AO2
SLP188 T02610183
DEN 1856 161853Z
00000KT 10SM BKN022
OVC033 02/M04 A3042
RMK AO2 SLP299
T00221039
AOC END

METAR/TAF Airport Information

Decoded METAR History for Airport KDEN 1/1

Time	Visib	Cell	Pres	WndDir	WndSpd	Temp	DwPt
18:53	10	22	A30.42	0	0	2	-4

Prior observation unavailable
Earliest observation unavailable

Most Recent Undecoded METAR for Airport KDEN

4/16/01 19:1
KDEN 161853Z 00000KT 10SM BKN022 OVC033 02/M04
A3042 RMK AO2 SLP299 T00221039=

Most Recent Undecoded TAF for Airport KDEN

No recent data available

AUTO Status = AUTO OFF
TRANSACTION Status = not active

RDR expired RDR 19:10 COM AUTO POS AUTO

1464
Microsoft Windows 2000 Professional Windows 98

FUJITSU STYLISTIC 3400

Net Results of Having Real Time Wx

- More accurate flight planning.
 - LAX-JFK 8am departure
- ATC ground stops.
- UAL size carrier can save est.1-2% fuel per year. (NASA Langley study)
- Est. 2% reduction in total block time
- Est. 80% reduction in all turbulence injuries.
- CAT/Wx predictions internationally.
- First phase towards true Free Flight.



Implementation Issues

- Display...where and what kind?
 - Removable PED display on adjustable simple mount. (Sky-Pad)
 - Not in primary field of view.
 - Cost effective for procurement to AT/GA.
- Certification Issues:
 - Supplemental information?
 - Collaborative decision making.
 - Other software driving certification?



Implementation Issues

- Data pipe to the aircraft?
 - L-Band, Satellite, GTE Phone data receiver.
 - AT/GA solutions that are cost effective. \$\$\$
- STC's of mounting unit.
- 80% of AOC communications



United Focus

- AT/GA solution.
- Solution must be cost effective.
- Safety makes this priority.



Questions?

