



# HITL

## Human in the loop

**Airports Authority of India**





# HITL

Modernisation program that aims to achieve a positive change can be categorized as:

- **Development of decision support tools** (e.g., *Traffic Management Advisor, Medium Term Conflict Detection*),
- **Procedural changes** (e.g., *RVSM, RHS, ADS-C Climb Descent Procedure, A-CDM during Fog/ Adverse Weather* )
- **Advanced concepts** (e.g., *Dynamic Re-sectorization, Simultaneous Opns on two/three runways, CDOs, UPRs*)
- **New software/hardware** (e.g., *Standard Terminal Automation Replacement System, Display System Replacement, Medium Term Conflict Detection, A-CDM*), **and**
- **Advanced technology** (e.g., *Global Positioning System, GAGAN, Tools in A-SMGCS, Data Link, ADS-B* ).



# HITL

## IMPACT ON HUMAN

- Validation activities vary for different types of programs.
- The level and importance of validation efforts also vary. They depend upon the potential changes that a modernization initiative may produce.
- The impact of an ATM initiative on the human operator is of primary importance and is therefore a key element of the validation process.





# HITL

Factors that could be impacted by ATM Modernization Programme ( Ref FAA Human Factors Job Aid, 1999 )

1. **Workload**: Operator and maintenance staff task performance and workload.
2. **Training**: Minimized need for operator and maintenance staff training.
3. **Functional Design**: Equipment design for simplicity, consistency with the desired human-system interface functions, and compatibility with the expected operation and maintenance concepts.
4. **CHI/HMI**: Standardization of computer-human interface (CHI)/human-machine interface (HMI) to address common functions, employ similar user dialogues, interfaces, and procedures.

*i/ii contd.*





# HITL

Factors that could be impacted by ATM Modernization Programme ( Ref FAA Human Factors Job Aid, 1999 )

5. **Staffing:** Accommodation of constraints and opportunities on staffing levels and organizational structures.

6. **Safety and Health:** Prevention of operator and maintainer exposure to safety and health hazards.

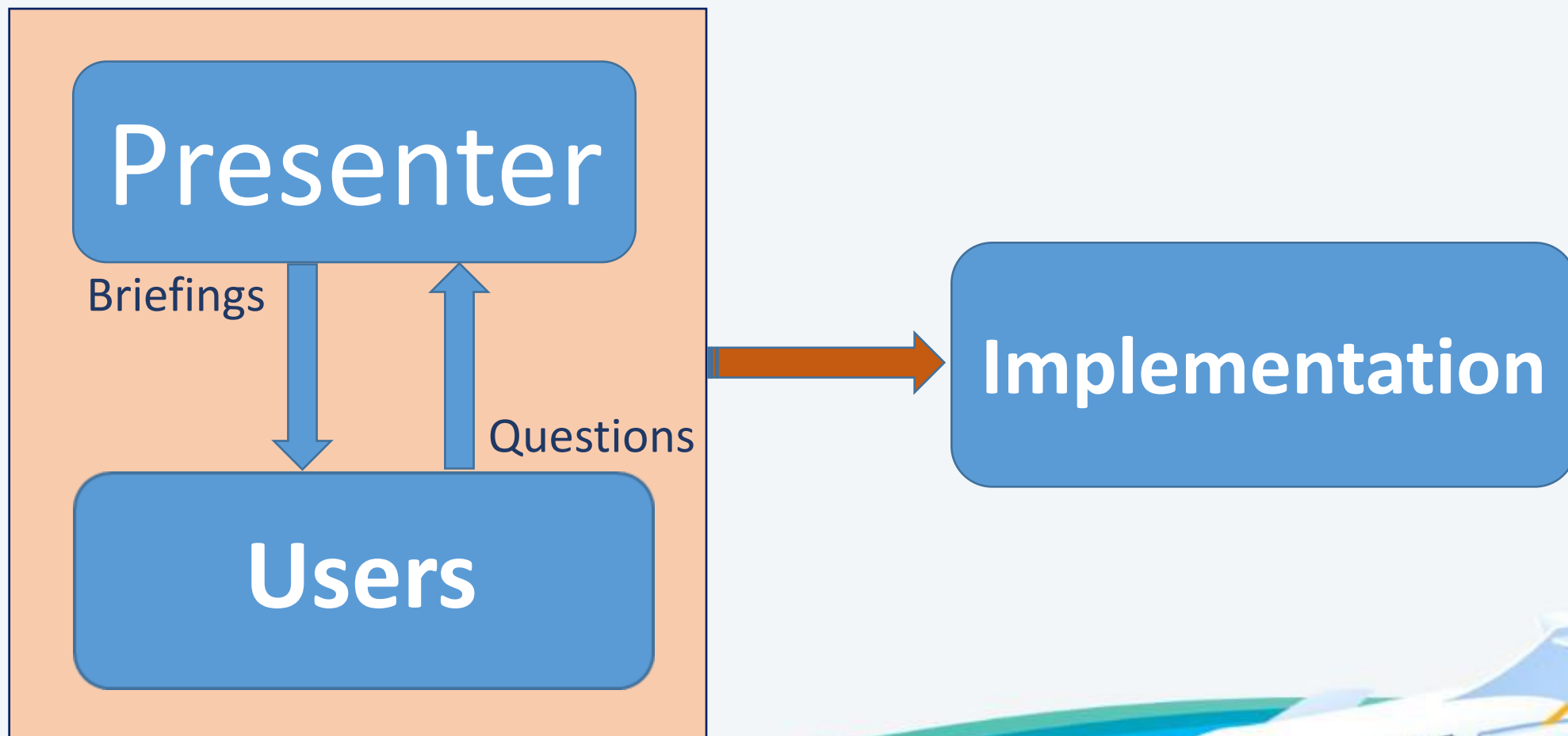
7. **Special Skills and Tools:** Considerations to minimize the need for special or unique operator or maintainer skills, abilities, tools, or characteristics.

8. **Work Space:** Adequacy of work space for personnel and their tools and equipment, and sufficient space for the movements and actions they perform during operational and maintenance tasks under normal, adverse, and emergency conditions.



# Past Methodology

Conduct workshops



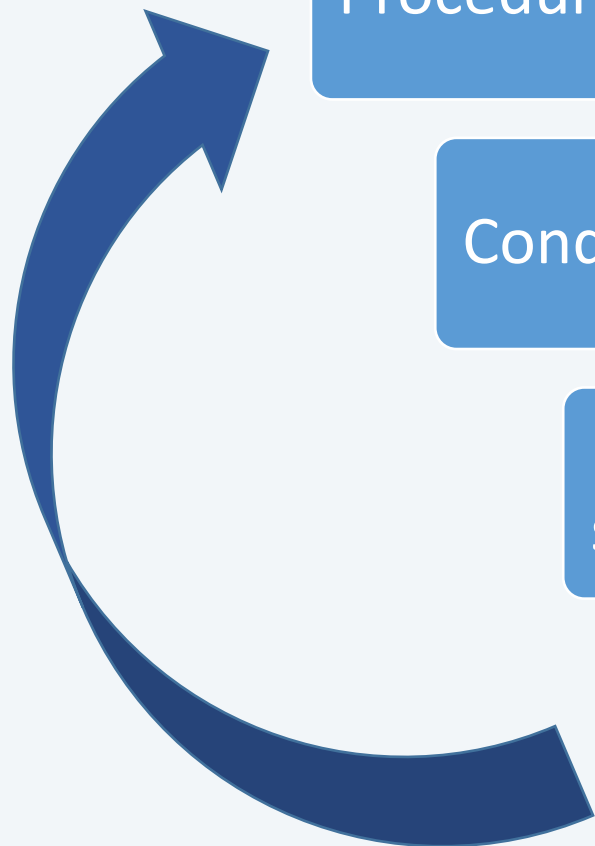
# Changes due HITL

Procedures proposed

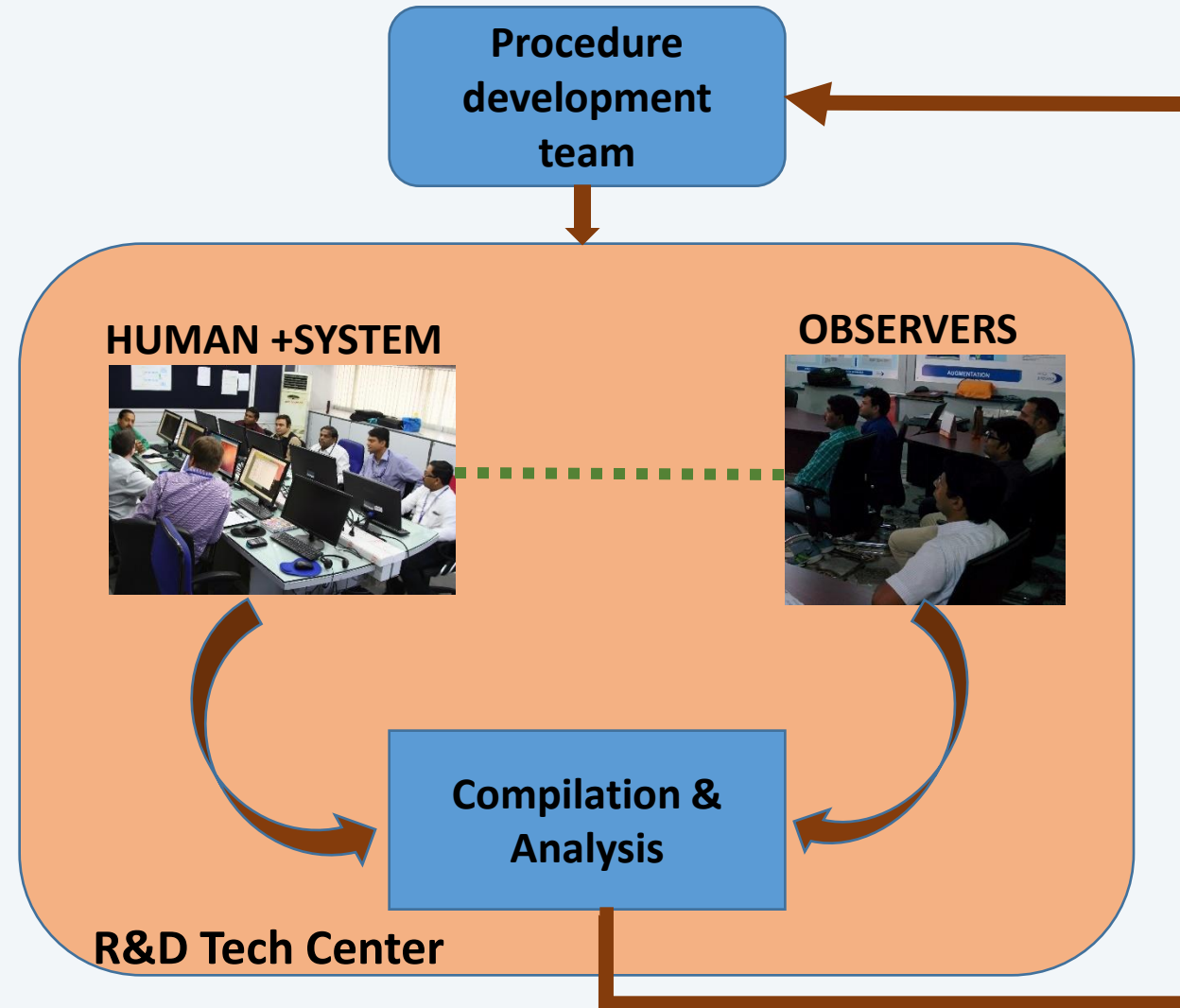
Conduct HITL

Identify problems in procedures/ATM systems

Reports and Recommendations



# Current Methodology – HITL

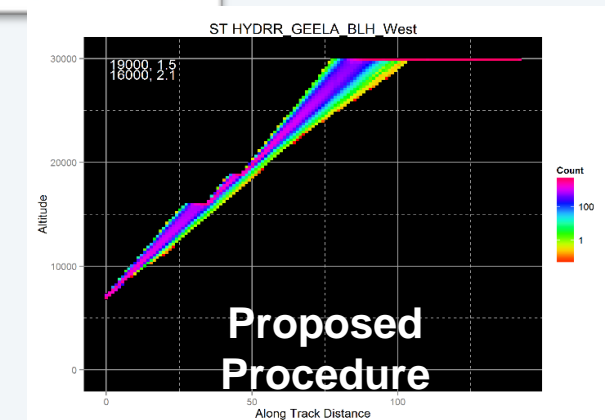
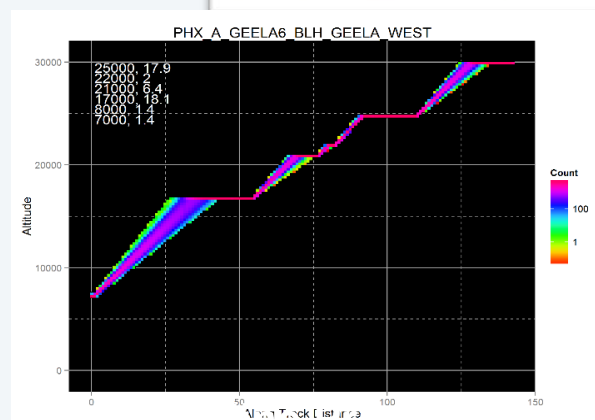
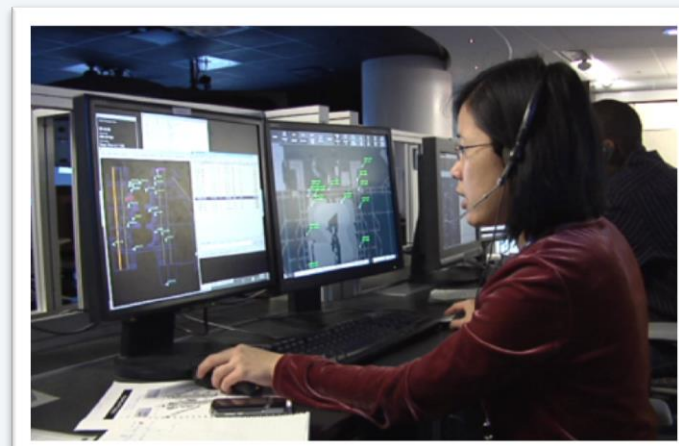






# HITL Lab in India

- Readily allows problem identification
- Test airspace concepts
- Test decision support tool and requirements for automation



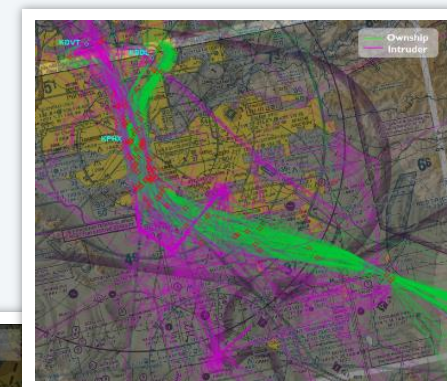
# HITL Lab in India Cont'd.

- Assess the human factors associated with the procedures
- Assess traffic workability issues and other impacts on ATS
- Gain controller acceptance



# HITL Lab in India Cont'd.

- Identify potential safety hazards
- Reduce time and cost



TCAS RA: EJA719 <-> N65798

TCAS Alert  
TCAS Resolution Advisory (RA): DO NOT DESCEND

Advised Vertical Rate: 0.00 ft/min  
Vertical Separation: 401 ft  
Vertical Closure Rate: -0.00 ft/min  
Horizontal Separation: 0.00 NM  
Horizontal Closure Rate: 0.01 NM/min  
Slant Range: 25.60 ft  
Alert Time: 2012.03.13 23:17:57.00

Ownship			Intruder		
ACID:	EJA719		ACID:	N65798	
Alt:	5000		Alt:	4599	
Latitude	N 33° 20' 17.16"	17.16"	Latitude	N 33° 22' 31.23"	31.23"
Longitude	W 111° 58' 12.77"	12.77"	Longitude	W 111° 59' 14.40"	14.40"

Help Close





# HITL OUTPUT

- Work load assessments
- Human Performance
- Training Needs
- Review of Procedures w.r.t human element
- Airspace capacity





# Tools used in HITL for analyzing human factors

- TCAS (TRAFFIC COLLISION AVOIDANCE SYSTEM)
- TAWS (TERRAIN AWARENESS AND WARNING SYSTEM)
- MERGING AND SPACING
- METRICS
- RECORDINGS AND LOGS OF SIMULATION ACTIVITIES
- QUESTIONNAIRES TO HITL PARTICIPANTS
- OBSERVERS' FEEDBACK





# HITL - achievements

- i. Two RNAV-5 City Pairs - Delhi – Bangaluru, Delhi-Trivandram – analysis completed.
- ii. Extension of Delhi – Chennai – Colombo route – analysis completed.
- iii. Emulation of Automation Systems of Hyderabad/Banagaluru, Delhi/Mumbai completed.
- iv. Emulation of other Automations Systems – under consideration
- v. Real time traffic simulation of Afghanistan-Traffic completed.





# HITL



## Thanks

