A FLIGHT TEST FACILITY DESIGN FOR EXAMINING DIGITAL INFORMATION TRANSFER

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AIRCRAFT / GROUND INFORMATION EXCHANGE

OBJECTIVE: EXPLORE AND DEFINE INTERFACE / MESSAGE CONCEPTS FOR EFFECTIVE INFORMATION EXCHANGE THROUGH DATA LINK SYSTEMS

SYSTEMS CHALLENGES:
- USER-CENTERED AUTOMATION
- DATA BASE COMPATIBILITY
- OPERATIONAL PROCEDURES

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DATA LINK RESEARCH ACTIVITIES

PRIMARY DIRECTION: ATC/WEATHER COMMUNICATIONS

- SINGLE PILOT IFR PROGRAM
  - FLIGHT EVALUATION -- CR-3461 / CR-3653
  - SIMULATOR INVESTIGATION -- TP-2837

- DEVELOPMENT OF AN AIR GROUND DATA EXCHANGE CONCEPT:
  - FLIGHT DECK PERSPECTIVE -- CR-4074
  - ATC GROUND PERSPECTIVE -- BEING DRAFTED

- NASA ATOPS COMMERCIAL JET TRANSPORT OPERATIONS
  - INITIAL PILOTED SIMULATION -- TP-2859
  - TOUCH PANEL/COMPUTERIZED VOICE INTERFACE -- PILOTED SIMULATION -- COMPLETED
  - TYPICAL AIRLINE MISSION FLIGHT PROFILE -- FLIGHT TEST -- NOV '89

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NASA Transport System Research Vehicle (TSRV)

TSRV Research Cockpit

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DATA LINK RESEARCH SETUP

Data Link Display Format

LARGE WINDOW

MEDIUM WINDOW

SMALL WINDOW

ACTIVE TOUCH AREAS

MESSAGE ANNUNCIATION AREAS (AND ACTIVE TOUCH AREAS)
MAIN MENU

ATC
WEATHER MENU
ATIS
NASA GROUND
VIEW CLEARANCE
VIEW MESSAGES

MAIN MENU

ATC 164215:
NASA 515, TURN LEFT TO 350,
DESCEND AND MAINTAIN FL310

ROGER
ROGER ENTER
UNABLE

WCP MSG
INITIAL TSRV
DATA LINK FLIGHT TEST

TEST OBJECTIVE: COMPARISON OF CURRENT VOICE COMMUNICATIONS TO DIGITAL INFORMATION TRANSFER FOR AN EFIS-EQUIPPED TRANSPORT AIRPLANE DURING FULL MISSION SCENARIO TYPICAL OF COMMERCIAL AIRLINE FLIGHT OPERATIONS

SPECIFIC FOCUS:
• ADVANCED DATA LINK/CREW INTERFACE DESIGN
• CREW ACCEPTANCE AND PERCEIVED WORKLOAD
• ROUND-TRIP COMMUNICATION RESPONSE TIME
• AUTO-ENTRY OF DATA (PILOT APPROVED) INTO AIRCRAFT SYSTEMS

FLIGHT TEST SETUP

COMMUNICATIONS CAPABILITY COMPARISON:
• VOICE RADIO ONLY
• DATA LINK WITH CRT DISPLAY + VOICE RADIO BACKUP
• DATA LINK WITH CRT DISPLAY + COMPUTERIZED VOICE OF DATA LINK MESSAGE + VOICE RADIO BACKUP

TYPE OF COMMUNICATIONS MESSAGES:

VOICE TRANSMISSIONS
  - ATC SIGN-ON
  - URGENT
  - TRAFFIC CALLS
  - NEGOTIATIONS

DIGITAL COMMUNICATIONS
  - ATC TACTICAL
  - INFORMATION (ATC, WEATHER, ATIS, NASA GROUND)
  - ATC STRATEGIC
FLIGHT TEST SETUP - (CONC)

FLIGHT PROFILE:
- TAKEOFF AND LANDING AT NASA WALLOPS FLIGHT FACILITY
- THREE PHASE FLIGHT PATH (~250 NM)
  - TAKEOFF AND CLimb
  - ABBREVIATED CRUISE
  - DESCENT AND LANDING

TEST SUBJECTS:
- COMMERCIAL LINE PILOTS

DATA COLLECTION:
- PILOT COMMENTS, QUESTIONNAIRE, DEBRIEFING
- SWAT
- MESSAGE AND TRANSMISSION/RESPONSE TIMES
- AIRPLANE STATE AND FMS AND FLIGHT CONTROL SYSTEM CONFIGURATION