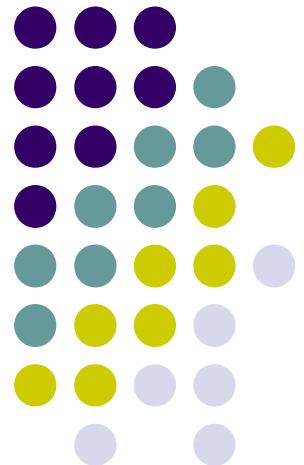
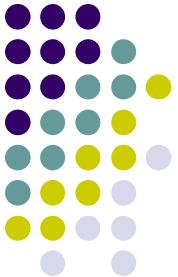


NAOMS Development and Application

by Robert S. Dodd, ScD
to
The National Research Council
June 9, 2008



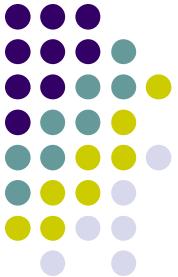


Presentation Focus

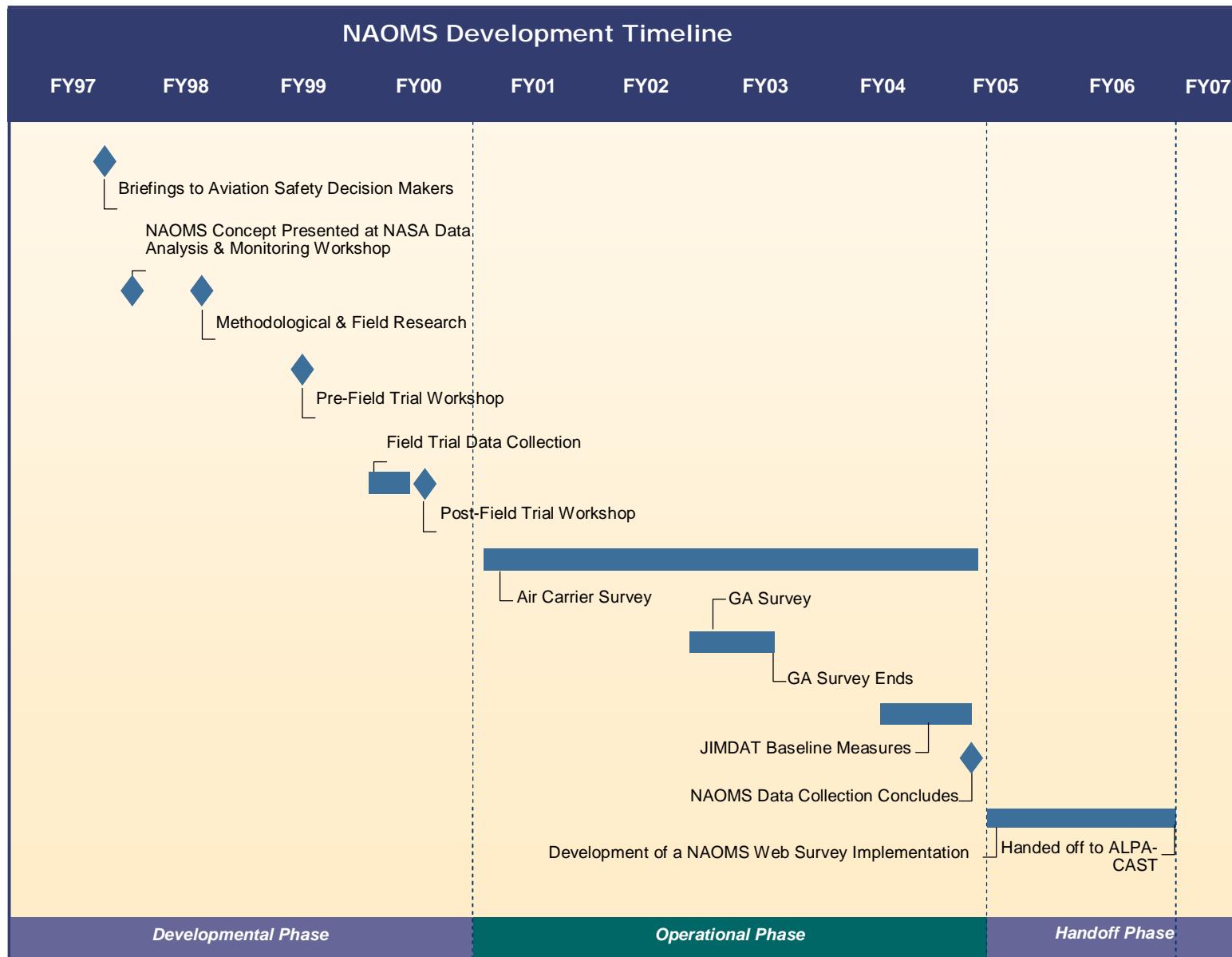
- | Development phase
 - | Aviation industry outreach (briefings/workshops)
 - | OMB approval
 - | Field research and concept testing
- | Operational phase
 - | Air carrier data collection
 - | General aviation data collection
 - | Sampling considerations
 - | Interviewing process
- | Handoff phase
 - | Web application
 - | ALPA handoff

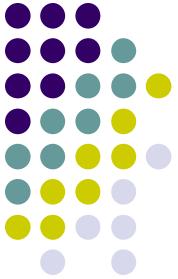


Development Phase



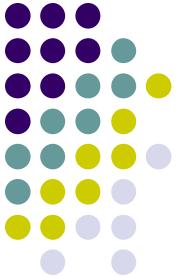
NAOMS Milestones





Early Development Activities

- | Focus: Air Line Pilots
- | Feasibility assessment
 - | Background research
 - | Literature review
 - | Potential respondent demographics
 - | Methodological issue id and evaluation
 - | Field research
 - | Conducted multiple facilitated focus groups with air carrier pilots
 - § Obtained extensive listing of safety experiences
 - § Solicited input on their likely response to a NAOMS survey
 - | Conducted research with individual pilots to explore
 - § Ability to recall events
 - § Method of categorizing events
 - | Briefed industry organizations

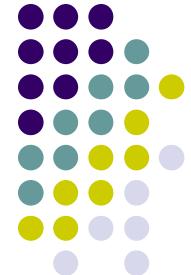


Developmental Questions

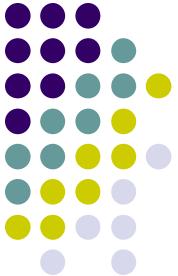
- | Research questions included
 - | What is the appropriate content for the questionnaire?
 - | How should the questionnaire be structured?
 - | Question wording
 - | Question order
 - | What would be the best recall period?
 - | What data collection mode should be used?
 - | What sample frame would we use for pilot identification?
- | Questions evaluated and findings presented during a one day workshop

NAOMS One-Day Workshop 1

Washington DC,
May 11, 1999



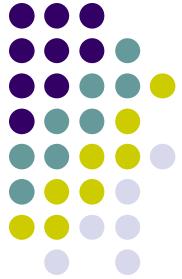
- | 40 non-NAOMS participants
 - | AIA
 - | ALPA
 - | ATA
 - | FAA
 - | HAI
 - | GAMA
 - | NASA
 - | NBAA
 - | NTSB
 - | Flight Safety Foundation
 - | Sandia Labs
 - | Academics
 - | Consultants
- | Presented full NAOMS concept
 - | Described Field Trial plans
 - | Presented draft questionnaire for evaluation
 - | Working discussion to obtain feedback
 - | Requested on-going feedback as desired by participants
 - | Modified questionnaire based on input
- | Committed to second workshop to present Field Trial findings



NAOMS: Field Trial

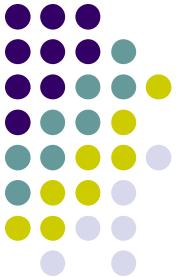
I Goals:

- I Determine feasibility of concept and methodology
 - I Can survey research techniques provide quality safety information from the aviation community?
 - I Sufficient to measure high-level safety trends?
- I Thorough and comprehensive evaluation
 - I Based on solid science and the best knowledge on survey methodology
 - I Wanted accurate estimates so feasibility, program cost, sample size requirements could be evaluated



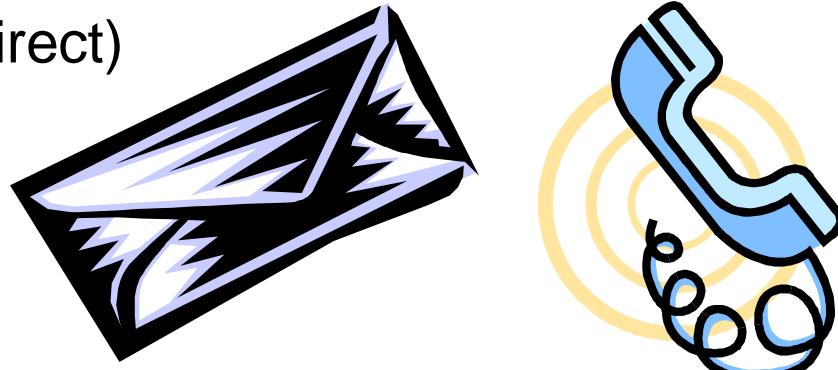
Survey Field Trial

- | Assessment of the survey instrument and procedures
 - | Limited to air carrier pilots
 - | Various versions were tested
- | Variations
 - | Mode (telephone, mail, face-to-face)
 - | Recall period
 - | Question order
 - | Topical focus
- | Interviewer training and performance

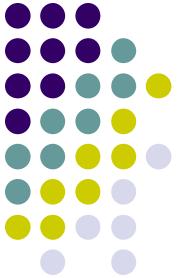


Field Trial Findings

- | 627 completed interviews
 - | Cost per completed (direct)
 - | Mail \$60
 - | Telephone \$75
 - | Completion Rate
 - | Mail 70%
 - | Telephone 81%
 - | % missing responses
 - | Mail 4.8%
 - | Telephone 0.0%
 - | Respondent Confidence
 - | Generally high
 - § Varied as a function of recall period

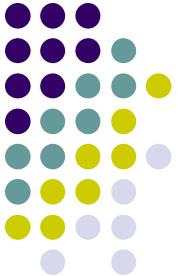


In-Person Interviewing
Terminated Early d/t Time
and Cost Investment



Field Trial Conclusions

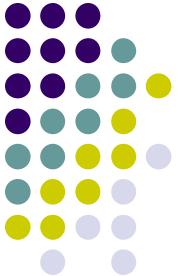
- | Pilot response to survey was positive
 - | High completion rates
- | The results indicated the most effective and efficient way to apply the questionnaire was via telephone interviewing
 - | 10 to 20% more expensive than mail but;
 - | better response rate
 - | better accuracy
 - | better question completion
 - | Most common method for other surveys



NAOMS One-Day Workshop 2, Alexandria, VA

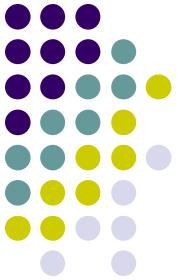
March 1, 2000

- | 30 non-NAOMS participants
 - | AIA
 - | Airbus
 - | ALPA
 - | ATA
 - | FAA
 - | HAI
 - | GAMA
 - | NASA
 - | NBAA
 - | NTSB
 - | US Air Force
 - | Continental Airlines
 - | Flight Safety Foundation
 - | Academics
 - | Consultants
- | Presented field trial findings
- | Asked for input on
 - | NAOMS Program
 - | Process
 - | Questionnaire
 - | Future Directions
- | Participants discussed issues in afternoon working groups

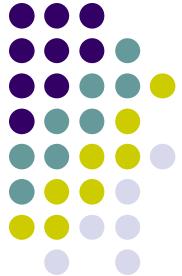


OMB Approval

- | Office of Management and Budget Approval Required
 - | Paperwork reduction act
 - | Announced in the Federal Register
- | OMB application package developed concurrent with developmental phase
 - | Limited to Air Carrier Pilots
 - | OMB areas of interest included
 - | NAOMS justification
 - | Sample size
 - | Survey Instrument
 - | Respondent Burden
 - | Confidentiality
 - | Cost
- | Comprehensive review
 - | NASA HQ involved in package review and approval
 - | Lengthy process
- | General aviation required new submission



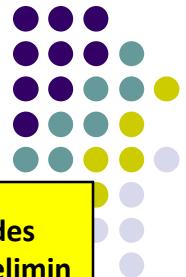
Operational Phase



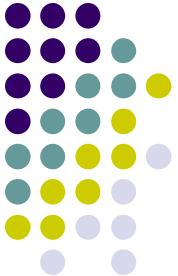
Operational Data Collection

- | Air Carrier Data Collection
 - | March 2001 – December 2004
 - | 3 years, 9 months
 - | First year some methodological issues still being evaluated
 - § Panel verses random design
 - § Recall period
 - | 26,105 completed interviews
- | General Aviation Data Collection
 - | August 2002 –March 2003
 - | 9 months
 - | 4,777 completed interviews

Community Outreach

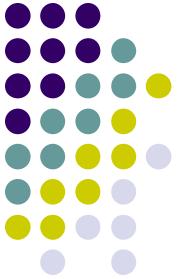


Date	Audience	Subject	Includes Preliminary Data
1998-03-05	ASIST Process Team?	NAOMS Concept	No
1998-11-13	NASA ASRS Advisory Subcommittee	Development Approach	No
1999-05-11	Invited Stakeholders	NAOMS Workshop 1	No
2000-01-26	AvSPEC	Program Overview; Partial Field Trial Results	Yes
2000-03-01	Invited Stakeholders	NAOMS Workshop 2	Yes
2002-08-28	NASA Ames, ICAC Contractors	ICAC Results	Yes
2002-12-05	NASA Langley Lewis-Finelli	Program Overview; Preliminary Results	Yes
2003-04-09	FAA Senior Management	Detailed Program View; Results to Date	Yes
2003-05-07	NRC Review Committee	NAOMS Program Review	Yes
2003-08-05	FAA-JIMDAT	NAOMS Overview and Status	Yes
2003-12-18	NAOMS Working Group	Meeting 1, NAOMS Status and Results Review	Yes
2004-05-05	NAOMS Working Group	Meeting 2, NAOMS Status and Results Review	Yes
2004-06-16	CAST-JIMDAT	Construction of JIMDAT Section C	No
2004-09-01	FAA ATO	Program Overview, Section C ICAC Results	Yes
2004-09-08	FAA Tech Center	Program Overview	Yes
2005-01-26	CAST-JIMDAT	JIMDAT Section C Results	Yes
2005-01-28	CAST	JIMDAT Section C Results	Yes



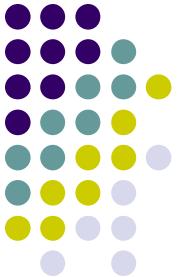
Interviewing and Sampling

- | Centers for Public Health Research and Evaluation (CPHRE) conducted interviews
 - | Managed initial data collection and sample draw
 - | More than 20 years conducting surveys (in 1998)
 - | Conducting ~100 projects a year
 - | Clients included CDC, NCI, EPA, other federal agencies and research foundations
 - | Highly skilled methodologists, statisticians and interviewers



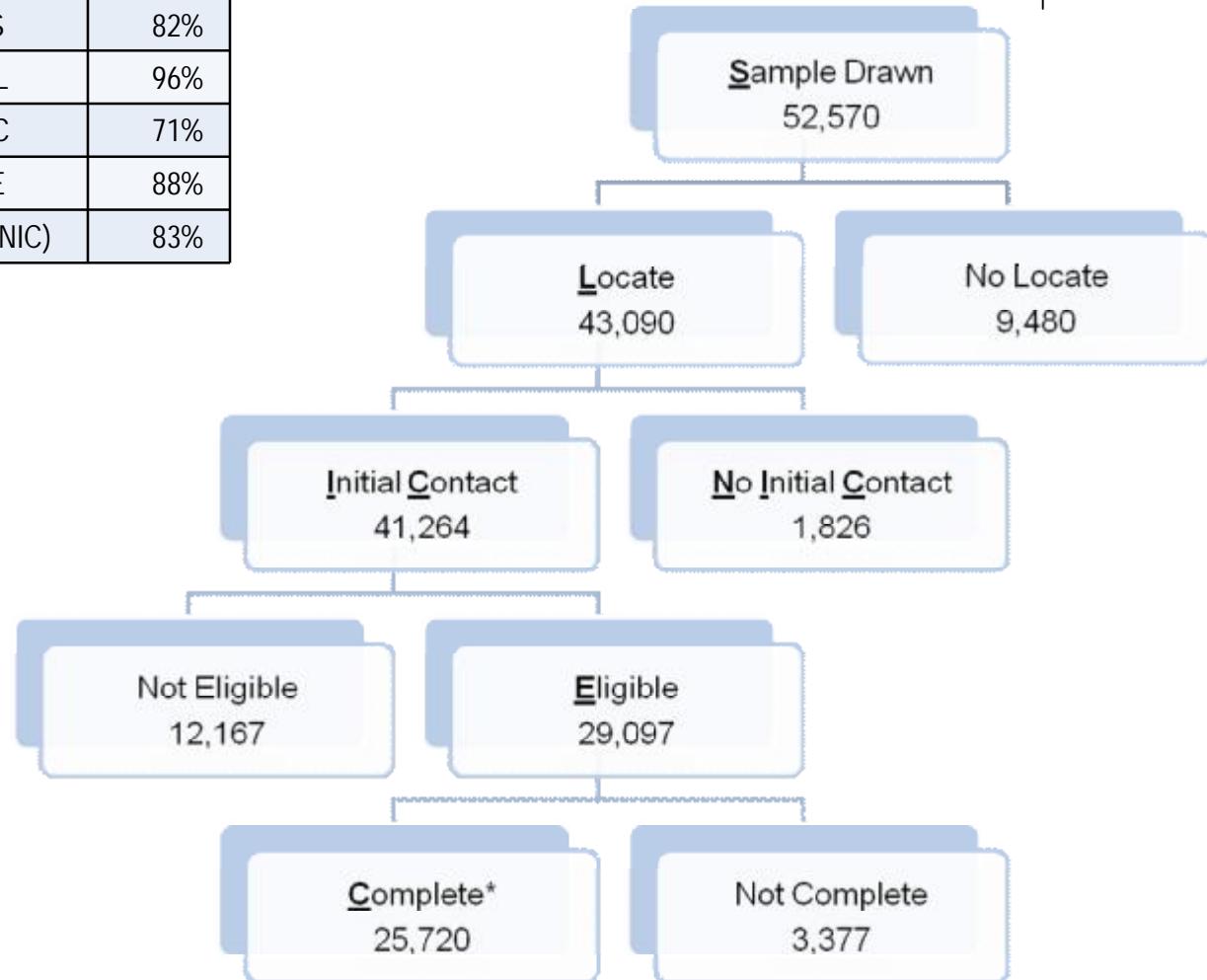
Sampling

- | Sample source
 - | Airmen Registration Database (releasable)
 - | total N = 670,000
 - | Available online at FAA Oklahoma City
 - | Names, pilot ratings and addresses; no telephone number
 - | No field indicating pilot is active commercial pilot
 - | Demographic report indicated ~ 90,000 pilots flying air carrier
 - | Filtered by pilot rating type
 - | Air Carrier Pilot
 - § Airline Transport Pilot (ATP) multi-engine rating
 - § Flight engineer rating
 - | General Aviation Pilots
 - § All non-air carrier pilots

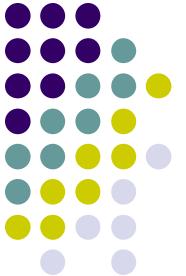


NAOMS Air Carrier Survey Response Rate (2001 thru 2004 Period)

Rate	Formula	Rate
Location	L / S	82%
Initial Contact	IC / L	96%
Eligibility	E / IC	71%
Completion (formula 1)	C / E	88%
Completion (formula 2)	C / (E + NIC)	83%

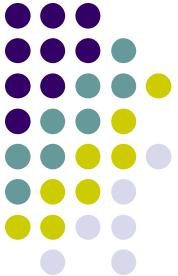


* This number excludes 407 completed air carrier interviews conducted from the GA survey track.



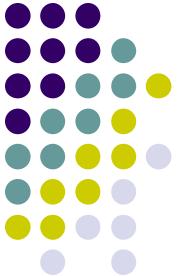
Sample Coverage

- | Believe sample frame is roughly 40% of active pilots
- | Two factors
 - | FAA option for pilots to remove name from public list
 - | Absence of field indicating active commercial pilot status
- | Apparent effects
 - | “Left seat” bias
 - | Bias towards widebody operations
 - | Bias away from small transport aircraft
- | Must be considered during analysis



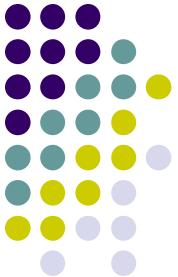
Locating Pilots

- | Sample addresses updated and telephone numbers obtained from
 - | National Change of Address database
 - | Telematch database
 - | Other sources, such as Directory Assistance, Web sites



Advance Letter

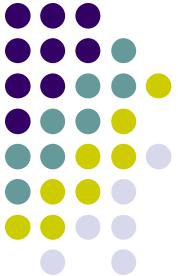
- | Sent to pilots about a week before calling
 - | NASA letterhead/envelopes
 - | Signed by NASA project managers
 - | Explained purpose of study, what participation meant, confidentiality, who will call, etc.
 - | Provided contact number for NASA project manager if potential respondent had questions
 - | Initial telephone call made
 - | Interview conducted or scheduled for another time



Professionalism of Interviewers

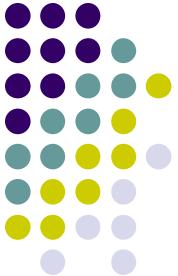
- | Professional interviewers
- | Interviewers given 16 hours of aviation background and terminology training
 - | “Certified” by conducting test interviews with NAOMS aviation staff
- | Sample of CATI interviewers’ work was silently monitored by a supervisor for accuracy and correctness
- | Deviation from questionnaire text not allowed.
 - | Notes taken on confusing questions
 - | Consistency of question application required





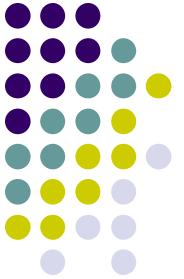
Screening for Eligibility

- | Initial questions during the interview were screening questions
 - | Air Carrier
 - | Determine pilot had flown in last 60 days as commercial pilot
 - § If no, interview stopped
 - | General Aviation
 - | Determine pilot had flown in last 60 days as
 - § Helicopter pilot
 - § Fixed wing general aviation pilot
 - § Air carrier pilot (not captured in air carrier sample)
 - § If no, interview stopped
- | Average interview length
 - | Air Carrier = 20-35 minutes (Section C dependant)
 - | General Aviation = 27 minutes

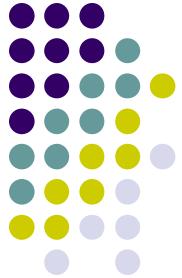


Conducting the Interview

- | Interviewers conducted interviews using computer-assisted telephone interviewing (CATI)
- | Interviewer administered questionnaire from a secure telephone center
- | Policy required that pilot contact information and responses remain separate at all times
- | Questionnaire pre-programmed into computer so data entered immediately--no additional data entry
- | CATI had error checks built into the programs--required little editing
 - | Data cleaned for outliers due to typos, question misinterpretation, etc
 - | Outlier values segregated not discarded
 - | 10% of each interviewer's work was validated

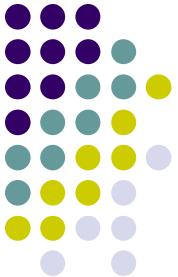


Handoff Phase



Web Questionnaire Development

- | NAOMS questionnaire is complex
 - | 100 top level questions
 - | 150 total questions including sub questions
 - | Multiple skip questions
- | Tried COTS web survey software
 - | User experience unacceptable
 - | Developed custom solution
 - | Much improved user experience
 - | Response rate however was only 20%
 - | Brief trial run
 - § Look for major discrepancies between CATI and web application
 - § Not apparent at level of review conducted (Doesn't mean differences didn't exist)
 - § ALPA at the behest of the CAST offered to assume control of the web application
 - § Application documented, training conducted, handoff occurred January 2007
 - § ALPA primarily interested in Section C



Summary Development and Application

- | Development phase
 - | Approach developed in consultation with aviation industry
 - | Field tested
 - | Most but not all methodological issues resolved
- | Operational phase
 - | Remaining design issues resolved
 - | Very high response rates
 - | High confidence among respondents
 - | 26,105 air carrier interviews completed
 - | 4,777 general aviation interviews completed
- | Handoff
 - | Web application developed and tested
 - | Respondents report high ease of use