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

NAOMS Development Timeline

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Developmental Phase | Operational Phase | Handoff Phase
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

Goals:

- Determine feasibility of concept and methodology
  - Can survey research techniques provide quality safety information from the aviation community?
  - Sufficient to measure high-level safety trends?
- Thorough and comprehensive evaluation
  - Based on solid science and the best knowledge on survey methodology
  - 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 versus random design
    - Recall period
  - 26,105 completed interviews

- **General Aviation Data Collection**
  - August 2002 – March 2003
  - 9 months
  - 4,777 completed interviews
## Community Outreach

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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)

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<td>Initial Contact</td>
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<td>Completion (formula 1)</td>
<td>C / E</td>
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<td>Completion (formula 2)</td>
<td>C / (E + NIC)</td>
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*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

1. 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

2. 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