

APPENDIX E
RAND SKILLS AND EXPERIENCE QUESTIONNAIRE

This appendix includes a copy of the cover letter that accompanied the RAND *Skills and Experience Questionnaire* and the questionnaire itself. The questionnaire was administered to the NTSB technical staff during the summer of 1998.

August 14, 1998

TO: NTSB Technical Staff
FROM: RAND Institute for Civil Justice
SUBJECT: Distribution of Skills and Experience Questionnaire

RAND is currently performing a study for the NTSB, one element of which focuses on assessing future training needs. The goal is to review current hiring patterns and training initiatives. The study will also examine technological trends in transportation systems with the purpose of identifying any additional skills that will be needed to investigate accidents in the future.

An important element of our research is a survey of current capabilities. This is the aim of the enclosed questionnaire. The questionnaire will help us gain insights into the NTSB as an organization — to identify, in a corporate sense, areas of technical strength and areas where additional hiring and training are required. The results of the questionnaire will help us build an integrated snapshot of the Board today. We are also performing a detailed analysis of training patterns and conducting interviews to understand the perspectives of professional staff members.

The RAND team is sensitive to the fact that questionnaires such as this place an additional burden on already busy schedules. We have attempted to design the questionnaire so as to minimize the time required to fill it out and have asked only for a level of detail needed to support our research. Please note that we are not asking that you identify yourself on the questionnaire. We intend to preserve the anonymity of the information we gather and will present survey data only in aggregate form. The data from this survey could significantly affect our study results, so we ask that your responses be as accurate as possible. To support our study schedule we also ask that you return the survey in the postpaid envelope as early as possible, but no later than September 11, 1998.

We sincerely appreciate your efforts in support of our research,

--- The RAND Team ---

NTSB Skills and Experience Questionnaire

Propriety of Information

This questionnaire is being distributed to acquire an aggregate portrait of NTSB, not to evaluate the skills and experience of individual staff members. RAND will maintain survey information as confidential. RAND will not report individual responses and will present results of the questionnaire in summary form only.

Purpose

As part of a study RAND is performing for the National Transportation Safety Board, we would like to learn more about your skills and experience related to investigating transportation system accidents. The information we seek is in part general, regarding your education and training in preparation for the job, as well as your continuing education on the job. Much of this is technical, regarding the various skills you have acquired in the design and operation of transportation systems. We estimate that it should take about 15 minutes of your time to complete the questionnaire. When you have completed the questionnaire, please return it in the enclosed envelope.

If you have any questions about the questionnaire, please feel free to contact Mr. Emile Ettegui at RAND: (202) 296-5000, ext. 5268 [Emile_Ettegui@rand.org]

Structure

The questionnaire is laid out in two parts. This first part contains questions to help us identify your professional status at NTSB and the portion of your time devoted to key aspects of your assignment. The second half of the questionnaire is a skills and experience matrix that will help us understand the distribution of NTSB capabilities. This information will greatly assist RAND in the evaluation of future NTSB training requirements.

PART I Questions

DIRECTIONS:

Answer each question.

POSITION AND BACKGROUND

1. What are your NTSB mail routing symbol and organization code ?
example
2. Do you occupy a management position at NTSB (office director or deputy director, regional director, division or field chief,...) ?
Yes No
3. Where did you work prior to joining NTSB (if hired from school check "Academia")?
 Government agency
 Industry *check one*
 Academia
 Military
 Other

4. a. Technical/vocational training (check all that apply)

- Technical speciality (e.g. airframe/powerplant mechanics, locomotive engineer,...)
specify:
- Associate degree
specify:
- Other
specify:

b. Bachelor's degrees (check all that apply)

- Engineering
 - Physical sciences or mathematics
 - Biological sciences
 - Social and behavioral sciences
 - Business/Management
 - Other (please specify)
- Specify degree:

c. Advanced degrees (check all that apply)

- Engineering
 - Physical sciences or mathematics
 - Biological sciences
 - Social and behavioral sciences
 - Business/Management
 - Law
 - Medicine
 - Other (please specify)
- Specify degree:

5. How many years of experience do you have as a transportation professional?

6. How many years have you worked at NTSB?

7. What is your age?

PROFESSIONAL DEVELOPMENT

8. In your opinion, is there enough time to obtain training to maintain and improve your professional skills?

Yes No

... your investigative skills?

Yes No

9. During the past year, could you help us better understand how you spent your time? Please estimate the fraction of time spent in each of the following categories (to add to 100%). If you have not been at the NTSB for an entire year, give the percentages to date.

Investigations of specific accident (within your office)

PART II Skills and Experience Inventory

DIRECTIONS:

ALL respondents should fill out the “Accident Investigation” section. Fill out additional sections (or parts of sections) in all areas where you feel you have relevant skills and experience. Rank your expertise from 1 to 5 in each category according to the qualitative measures on the right. If you have no skills or experience for a given item leave it blank.

- | | |
|---|---|
| 1 | PASSING KNOWLEDGE |
| | <ul style="list-style-type: none"> • Few hours of training, or • Conversant, but never apply knowledge in practical context |
| 2 | LIMITED KNOWLEDGE |
| | <ul style="list-style-type: none"> • Some formal training • Rarely called on to apply the knowledge |
| 3 | MODERATE KNOWLEDGE |
| | <ul style="list-style-type: none"> • Professional training in this area • Occasionally called on to apply knowledge |
| 4 | EXTENSIVE KNOWLEDGE |
| | <ul style="list-style-type: none"> • Maintain currency through training and self-education • Regularly apply knowledge in accomplishing job |
| 5 | EXPERT |
| | <ul style="list-style-type: none"> • Could teach the subject area • Rich set of skills and experience sufficient to lead others |

ACCIDENT INVESTIGATION

A. Planning and Implementation

Project management (planning, scheduling, budgeting, personnel relations,...)	1	2	3	4	5
Professional communication:					
Public speaking/public relations	1	2	3	4	5
Technical writing	1	2	3	4	5
Technical presentation	1	2	3	4	5
Family liaison	1	2	3	4	5
Media relations	1	2	3	4	5
Foreign language skills	1	2	3	4	5
Management of investigations:					
Coordination of parties (incl. rules of party process, information control,...)	1	2	3	4	5
Recovery and wreckage security	1	2	3	4	5

B. Analysis and Evaluation

Investigative procedures:					
Interviewing techniques	1	2	3	4	5
Evidence gathering and protection	1	2	3	4	5
Data cataloging and archiving	1	2	3	4	5
Wreckage recovery	1	2	3	4	5
Reconstruction and crash simulation	1	2	3	4	5
Failure analysis:					
Fracture mechanics	1	2	3	4	5
Corrosion failure causes	1	2	3	4	5
Matrix composite failure modes	1	2	3	4	5
Foreign object damage	1	2	3	4	5
Testing (nondestructive testing, fault isolation, etc...)	1	2	3	4	5
Systems analysis (incl. fault tree analysis)	1	2	3	4	5

Investigative science:					
Accident kinematics	1	2	3	4	5
Crash simulation	1	2	3	4	5
Accident reconstruction	1	2	3	4	5
Combustion and accident related fires	1	2	3	4	5
Explosives and taggants	1	2	3	4	5
Ballistics	1	2	3	4	5
Chemical analysis and assay	1	2	3	4	5
Toxicology	1	2	3	4	5
Forensic pathology	1	2	3	4	5
Data recovery and analysis (incl. transcription, FDR/CVR teardown, radar	1	2	3	4	5
Human performance factors:					
Group dynamics and team performance	1	2	3	4	5
Cognitive processes/decision-making	1	2	3	4	5
Crisis response, disorientation, task overload, workload factors	1	2	3	4	5
Drug-induced impairment (intoxicants, etc...)	1	2	3	4	5
Physiological factors (sleep deprivation, fatigue, etc...)	1	2	3	4	5
Human/machine interactions, automation	1	2	3	4	5
C. Legal Aspects of Accident Investigations					
Tort liability practices and procedures	1	2	3	4	5
Legal aspects of investigations:					
Selection of parties	1	2	3	4	5
Role of parties (including conduct)	1	2	3	4	5
Investigation authority and protocols	1	2	3	4	5
The litigation process:					
Role of technical/expert witnesses	1	2	3	4	5
Admissibility of NTSB report and factual findings	1	2	3	4	5
Deposition and trial procedures	1	2	3	4	5
Role of insurers	1	2	3	4	5

DIRECTIONS:

For sections (1) through (6), fill out sections and subsections in areas where you feel you have relevant skills.

(1) AVIATION SYSTEMS

A. Aircraft Design

Aerodynamics/stability and control	1	2	3	4	5
Structure and airframe:					
Construction techniques	1	2	3	4	5
Joinery	1	2	3	4	5
Metals and alloys	1	2	3	4	5

Composites	1	2	3	4	5
Plastics	1	2	3	4	5
Paints and anti-corrosion coatings	1	2	3	4	5
High temperature materials	1	2	3	4	5
Propulsion:					
Turbine	1	2	3	4	5
Reciprocating	1	2	3	4	5
Propellers	1	2	3	4	5
Engine/airframe integration	1	2	3	4	5
Rotorcraft propulsion systems (incl. transmissions, rotor rigging,...)	1	2	3	4	5
Flight control systems:					
Mechanical and servomechanical	1	2	3	4	5
Fly-by-wire	1	2	3	4	5
Flight control software	1	2	3	4	5
Aircraft operating systems:					
Hydraulics and pneumatics	1	2	3	4	5
Landing gear, wheel, brakes, tires	1	2	3	4	5
Fuel systems (storage, distribution, measurement, etc...)	1	2	3	4	5
Auxiliary power systems	1	2	3	4	5
Electrical/power systems	1	2	3	4	5
Environmental control (including oxygen systems)	1	2	3	4	5
Emergency and egress systems	1	2	3	4	5
Malfunction reporting and recording equipment (FDR, CVR, ELT, etc...)	1	2	3	4	5
Fire detection/suppression systems	1	2	3	4	5
Crew station engineering (instrumentation, flight deck automation, crew systems)	1	2	3	4	5
Avionics:					
Communications	1	2	3	4	5
Navigation (incl. GPS, INS, GPWS, TCAS landing aids,...)	1	2	3	4	5
Autopilot systems (including flight computers, auto-throttles,...)	1	2	3	4	5
Radar systems	1	2	3	4	5
Flight dynamics modeling and simulation	1	2	3	4	5
B. Aircraft Operations					
Ground operations:					
Maintenance and inspection	1	2	3	4	5
Repair and modification (including standards and regulations)	1	2	3	4	5

Loading and cargo handling (including weight and balance)	1	2	3	4	5
Ground servicing (including deicing procedures)	1	2	3	4	5
Airline flight operations (air carrier planning, operations, etc...)	1	2	3	4	5
Crew procedures (routine, emergency, instrument flight, etc...)	1	2	3	4	5
Training and simulation:					
Flight crew training	1	2	3	4	5
Ground and maintenance crew training	1	2	3	4	5
Air traffic management training	1	2	3	4	5
Air traffic management/control procedures (terminal, en-route, ground etc...)	1	2	3	4	5
Atmospheric effects (icing, precipitation, turbulence, windshear, etc...)	1	2	3	4	5

(2) MARINE SYSTEMS

A. Ship Design

Hydrodynamics and stabilization	1	2	3	4	5
Freight and containerized cargo	1	2	3	4	5
Liquid and LNG transports	1	2	3	4	5
Passenger ships	1	2	3	4	5
Event recording systems	1	2	3	4	5
Propulsion (diesel, diesel-electric, nuclear, turbine, fueling, etc...)	1	2	3	4	5

B. Sea Operations

Navigation (GPS, Loran, port procedures, hazard avoidance)	1	2	3	4	5
Communications	1	2	3	4	5
Emergency procedures (lifeboats, etc...)	1	2	3	4	5

(3) RAIL SYSTEMS

A. Rail Systems Design

Modeling and simulation:					
Track-train dynamics	1	2	3	4	5
In-train force	1	2	3	4	5
Locomotives:					
Diesel	1	2	3	4	5
Electric	1	2	3	4	5
Transit systems:					
Self-propelled units	1	2	3	4	5
Light rail vehicles	1	2	3	4	5
Cable cars	1	2	3	4	5
Commuter cars	1	2	3	4	5

Railroad car:					
Structural design	1	2	3	4	5
Repair and maintenance	1	2	3	4	5
Braking systems:					
Air brakes	1	2	3	4	5
Transit	1	2	3	4	5
Track design and repair	1	2	3	4	5
Control systems:					
Propulsion	1	2	3	4	5
Brakes	1	2	3	4	5
Fault monitoring and warning systems (incl. fire detection and suppression)	1	2	3	4	5
Signaling:					
Train control systems	1	2	3	4	5
Cab signals	1	2	3	4	5
Automatic train stop systems	1	2	3	4	5
Wayside systems	1	2	3	4	5
Communications:					
Radio	1	2	3	4	5
Telemetry systems	1	2	3	4	5
Defect detectors	1	2	3	4	5
Event recording systems	1	2	3	4	5

B. Rail Operations

Maintenance and repair:					
Locomotives and self-propelled systems	1	2	3	4	5
Cars	1	2	3	4	5
Track and infrastructure (incl. bridge, tunnel, trestle inspection,...)	1	2	3	4	5
Regulation/Certification (incl. operator certification, FRA, FTA, APTA standards,...)	1	2	3	4	5
Train handling	1	2	3	4	5
Dispatching and scheduling	1	2	3	4	5
Terminal operations	1	2	3	4	5
Securement of lading	1	2	3	4	5
Crew operations (work-rest cycles, training, testing,...)	1	2	3	4	5

(4) HIGHWAY SYSTEMS

A. Highway Design and Construction

Vehicle design:					
Cars and light trucks	1	2	3	4	5
Heavy trucks	1	2	3	4	5
Passenger and school buses	1	2	3	4	5
Emergency and specialty vehicles	1	2	3	4	5

Vehicle operations:					
Maintenance and repair	1	2	3	4	5
Operator procedures	1	2	3	4	5
Environmental effects	1	2	3	4	5
Safety systems (incl. air bags, anti-lock brakes, seat belts, child restraints,...)	1	2	3	4	5
Grade crossings:					
Design and operation	1	2	3	4	5
Maintenance	1	2	3	4	5
Regulatory/civil engineering standards	1	2	3	4	5
Bridges and overpasses:					
Design and construction	1	2	3	4	5
Maintenance and repair	1	2	3	4	5
Regulatory/civil engineering standards	1	2	3	4	5

(5) PIPELINE SYSTEMS

A. Pipeline Design and Construction

Directional drilling technology	1	2	3	4	5
Material properties and failure mechanisms	1	2	3	4	5
Pipeline systems and components:					
Natural gas	1	2	3	4	5
LNG	1	2	3	4	5
Liquids	1	2	3	4	5
Distribution and transmission networks	1	2	3	4	5
Storage facilities	1	2	3	4	5
Corrosion protection systems technology	1	2	3	4	5
Odorization technology	1	2	3	4	5
Risk analysis	1	2	3	4	5

B. Pipeline Operations and Maintenance

Operations:					
General operating requirements and procedures	1	2	3	4	5
SCADA systems	1	2	3	4	5
Inspection and testing requirements/standards (incl. non-destructive testing)	1	2	3	4	5
Training requirements	1	2	3	4	5
Maintenance:					
Leak detection and repair	1	2	3	4	5
Component maintenance and repair (incl. corrosion control)	1	2	3	4	5
Safety:					
Public education	1	2	3	4	5
Damage prevention programs	1	2	3	4	5

Pipeline locating	1	2	3	4	5
Failure investigation and reporting	1	2	3	4	5
Emergency plans	1	2	3	4	5
Fire detection / prevention systems	1	2	3	4	5
Facility security	1	2	3	4	5

(6) HAZARDOUS MATERIALS

Material properties and failure mechanisms	1	2	3	4	5
Design and maintenance of hazardous material containers (incl. non-destructive testing):					
Rail	1	2	3	4	5
Highway	1	2	3	4	5
Air	1	2	3	4	5
Marine	1	2	3	4	5
Tank technology (incl. coatings/linings, pressure cylinders,...)	1	2	3	4	5
Requirements and standards:					
UN performance standards	1	2	3	4	5
Packaging and labeling	1	2	3	4	5
Cargo transport and transfer	1	2	3	4	5
Substance detection and identification	1	2	3	4	5
Risk analysis	1	2	3	4	5
Safety:					
Fire detection / prevention systems	1	2	3	4	5
Routing	1	2	3	4	5
Emergency plans/evacuation/survival factors	1	2	3	4	5

ADDITIONAL COMMENTS

If you have any further comments on any skill or experience areas missing from the survey that you regard as important, please make them here and on the back of this page.
