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MATERIALS AND PROCEDURES FOR IN-FLIGHT ASSESSMENT OF AUDITORY FUNCTION IN AIRCREWMAN

Donald C. Gasaway, et al

School of Aerospace Medicine
Brooks Air Force Base, Texas

August 1973

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DONALD C. GASAWAY, Major, USAF, BSC

HARRELL C. SUTHERLAND, JR., M. Ed.

USAF School of Aerospace Medicine
Aerospace Medical Division (AFSC)
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Donald C. Gasaway, Major, USAF, BSC
Harrell C. Sutherland, Jr., M.Ed.

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13 ABSTRACT

The need to assess the ability of aircrewmen to perceive and understand voiced communications transmitted under headsets during flight conditions has been recognized since the early 1940s. A standardized approach is needed to evaluate the adequacy of auditory function in flyers who fail to pass pure-tone physical profile standards (Class II and III examinations). It is this need that prompted the research described in this report.

This report describes four sets of 50 phrases extracted from voice communications used in ground and airborne operations, as well as six lists of 50 single-syllable words. These lists have not been evaluated under the conditions proposed for their use.

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DONALD C. GASAWAY, Major, USAF, BSC
HARRELL C. SUTHERLAND, JR., M. Ed.

FOREWORD

This research was conducted by the Audiology and Hearing Conservation Function, Otolaryngology Branch, under task No. 7755-08-01 during the period November 1971 to June 1972. This paper was submitted for publication on 15 June 1973.

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This report has been reviewed and is approved.

EVAN R. GOLDMAN, Colonel, USAF, MC
Commander

ABSTRACT

The need to assess the ability of aircrewmen to perceive and understand voiced communications transmitted under headsets during flight conditions has been recognized since the early 1940s. A standardized approach is needed to evaluate the adequacy of auditory function in flyers who fail to pass pure-tone physical profile standards (Class II and III examinations). It is this need that prompted the research described in this report.

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CONTENTS

MATERIALS AND PROCEDURES FOR IN-FLIGHT ASSESSMENT OF AUDITORY FUNCTION IN AIRCREWMEN

I. INTRODUCTION

The U.S. Air Force performs a wide range of flight operations. Dependence upon electroacoustic voice communication systems has increased in parallel with the complexity of ground and airborne operations. Flying personnel routinely encounter a variety of environmental stresses that may decrease the overall effectiveness of their hearing, and if protection is not adequate, noise-induced hearing losses may occur (1, 3).

When an aircrewman fails to meet the hearing standards set forth in Air Force Manual 160-1 for Flying Class II (rated) and Class III (nonrated), a decision must be made whether or not the failure to meet the pure-tone criterion is significant enough to require removal from flying duties (4, 5). The primary factor governing this decision is the individual's ability to understand voice communications received during actual ground and airborne operations. Using standard measures of auditory function, the aeromedical evaluator cannot determine if an aircrewman has this capability. Experienced pilots may fail to meet Class II pure-tone hearing standards and may have difficulty hearing during everyday situations, yet have no significant problem communicating while in flight. The present clinical tests used to evaluate speech discrimination also fail to identify persons who have difficulty accomplishing listening tasks associated with flight.

A properly designed and executed in-flight hearing test would assess the functional hearing and allow an intelligent disposition of flyers with substandard hearing by conventional testing. In-flight hearing tests have been used for approximately 15 years; however, no standard approach to this task has been available.

This paper proposes the development, in the following five phases, of an in-flight hearing test: (1) selecting appropriate test materials, (2) arranging materials for standardized administration, (3) establishing tentative pass-fail criteria, (4) evaluating pass-fail criteria by feedback from field testing, and (5) revising and modifying test materials, procedures, and criteria so that standardization can be achieved.

II. PROCEDURE

Selection of test materials

Speech signals encountered within a variety of fixed- and rotary-wing aircraft, during various phases of ground and airborne operation, were recorded on electromagnetic tape. A vocabulary of single-syllable and two-word elements was compiled (2), from which samples were extracted and developed into test materials as follow.

TEST 1 -- EXAMINER'S TEST SHEET

List 1	List 2	List 3
1. LATE	1. RATE	1. DATE
2. PUMP	2. BUMP	2. DUMP
3. KEEP	3. BEEP	3. DEEP
4. BASE	4. RACE	4. CASE
5. RUT	5. CUT	5. NUT
6. BLIP	6. SHIP	6. FLIP
7. HAZE	7. BLAZE	7. RAISE
8. CHOP	8. STOP	8. FLOP
9. LUMP	9. SUMP	9. CLUMP
10. DIP	10. RIP	10. SKIP
11. DASH	11. FLASH	11. CRASH
12. FILL	12. SPILL	12. STILL
13. FIVE	13. LIVE	13. DIVE
14. FLAP	14. SLAP	14. SNAP
15. GUN	15. SUN	15. RUN
16. GEAR	16. NEAR	16. REAR
17. PURGE	17. SURGE	17. MERGE
18. LATCH	18. HATCH	18. BATCH
19. GROUP	19. SWOOP	19. LOOP
20. JET	20. GET	20. WET
21. HULL	21. NULL	21. GULL
22. HOOK	22. LOOK	22. CROOK
23. PHASE	23. DAZE	23. PAYS
24. CAGE	24. STAGE	24. PAGE
25. CODE	25. LOAD	25. NODE
26. CALL	26. STALL	26. FALL
27. LOG	27. FOG	27. SMOG
28. PITCH	28. WHICH	28. DITCH
29. LAST	29. BLAST	29. FAST
30. MIKE	30. STRIKE	30. LIKE
31. POD	31. SOD	31. ROD
32. SEAT	32. FLEET	32. NEAT
33. SIGHT	33. RIGHT	33. LIGHT
34. SCOPE	34. SLOPE	34. GROPE
35. SLIP	35. GRIP	35. STRIP
36. SPEED	36. NEED	36. BLEED
37. TAKE	37. BRAKE	37. LAKE
38. SENT	38. VENT	38. WENT
39. DECK	39. SPECK	39. WRECK
40. CLASH	40. BASH	40. TRASH
41. DWELL	41. SWELL	41. SMELL
42. MADE	42. BLADE	42. FADE
43. WILL	43. KILL	43. HILL
44. REELS	44. FEELS	44. MEALS
45. SCAN	45. SPAN	45. FAN
46. COARSE	46. FORCE	46. SOURCE
47. RIDE	47. SLIDE	47. GUIDE
48. RED	48. HEAD	48. LED
49. LOCKED	49. CLOCKED	49. BLOCKED
50. MIST	50. LIST	50. TWIST

TEST 1 -- ANSWER SHEET

SSAN:_____
NAME:_____ DATE:_____

INSTRUCTIONS: Mark through word heard. If not certain, guess.

List No._____

1.	LATE	DATE	RATE	26.	STALL	FALL	CALL
2.	DUMP	PUMP	BUMP	27.	LOG	SMOG	FOG
3.	BEEP	KEEP	DEEP	28.	DITCH	WHICH	PITCH
4.	RACE	BASE	CASE	29.	BLAST	LAST	FAST
5.	RUT	CUT	NUT	30.	MIKE	STRIKE	LIKE
6.	FLIP	BLIP	SHIP	31.	POD	SOD	ROD
7.	BLAZE	HAZE	RAISE	32.	NEAT	SEAT	FLEET
8.	STOP	FLOP	CHOP	33.	SIGHT	RIGHT	LIGHT
9.	LUMP	CLUMP	SUMP	34.	GROPE	SLOPE	SCOPE
10.	SKIP	DIP	RIP	35.	GRIP	SLIP	STRIP
11.	DASH	CRASH	FLASH	36.	NEED	SPEED	BLEED
12.	STILL	FILL	SPILL	37.	TAKE	LAKE	BRAKE
13.	FIVE	DIVE	LIVE	38.	SENT	VENT	WENT
14.	SLAP	SNAP	FLAP	39.	WRECK	SPECK	DECK
15.	SUN	RUN	GUN	40.	TRASH	CLASH	BASH
16.	GEAR	REAR	NEAR	41.	SWELL	SMELL	DWELL
17.	SURGE	PURGE	MERGE	42.	FADE	BLADE	MADE
18.	BATCH	HATCH	LATCH	43.	WILL	HILL	KILL
19.	GROUP	SWOOP	LOOP	44.	FEELS	REELS	MEALS
20.	GET	JET	WET	45.	SCAN	FAN	SPAN
21.	NULL	GULL	HULL	46.	COARSE	FORCE	SOURCE
22.	HOOK	CROOK	LOOK	47.	SLIDE	GUIDE	RIDE
23.	PAYS	DAZE	PHASE	48.	LED	HEAD	RED
24.	STAGE	CAGE	PAGE	49.	CLOCKED	BLOCKED	LOCKED
25.	CODE	LOAD	NODE	50.	MIST	TWIST	LIST

SCORE 2% for each word (All correct - 100%) SCORE_____% Examiner's initials_____

TEST 2 -- EXAMINER'S TEST SHEET

List 1	List 2	List 3
1. LATE	1. LAID	1. LANE
2. LEAN	2. LEAD	2. LEAK
3. HAD	3. HATCH	3. HASH
4. SPEED	4. SPEECH	4. SPEAK
5. GROSS	5. GROPE	5. GROVE
6. BUST	6. BUDGE	6. BUMP
7. REEL	7. READ	7. REACH
8. SLAP	8. SLAM	8. SLAB
9. HALF	9. HAVE	9. HANG
10. CHASE	10. CHANGE	10. CHAIN
11. GRADE	11. GRAZE	11. GREAT
12. TRIP	12. TRICK	12. TRIM
13. CREEP	13. CREAM	13. CREEK
14. FADE	14. PHASE	14. FACE
15. SUN	15. SUNK	15. SUB
16. PLACE	16. PLANE	16. PLATE
17. CAME	17. CASE	17. CAGE
18. CHICKS	18. CHIPS	18. CHILLS
19. SLANT	19. SLASH	19. SLACK
20. LEG	20. LED	20. LESS
21. MAZE	21. MAIN	21. MAKE
22. RAISE	22. RAID	22. RATE
23. HUT	23. HUNG	23. HUNT
24. JUDGE	24. JUNK	24. JUMP
25. LATCH	25. LAND	25. LAP
26. NET	26. NEST	26. NEXT
27. FLANK	27. FLAP	27. FLAT
28. SEAT	28. SEEM	28. CEASE
29. KEEN	29. KEEP	29. KEYS
30. WISH	30. WIND	30. WING
31. CLASP	31. CLAMP	31. CLAP
32. SUMP	32. SUCH	32. SOME
33. PATH	33. PAD	33. PAST
34. BLADE	34. BLAZE	34. BLAME
35. FAN	35. FAT	35. FAST
36. LOOSE	36. LOOP	36. LUBE
37. CHAFF	37. CHAP	37. CHAT
38. FEET	38. FIELD	38. FEED
39. CRASHED	39. CRACKED	39. CRAMPED
40. HOLD	40. HOSE	40. HOME
41. NODE	41. NOTE	41. NOSE
42. GATE	42. GAZE	42. GAIN
43. FIN	43. FILL	43. FIFTH
44. SKIP	44. SKIM	44. SKID
45. PACE	45. PAVE	45. PAYS
46. MADE	46. MATE	46. MALE
47. GULPS	47. GUNS	47. GULLS
48. MIST	48. MIX	48. MID
49. LID	49. LINK	49. LIFT
50. SURF	50. SURGE	50. SEARCH

TEST 2 -- ANSWER SHEET

SSAN:_____
NAME:_____ DATE:_____

INSTRUCTIONS: Mark through word heard. If not certain, guess.

List No._____

1.	LAID	LATE	LANE	26.	NET	NEST	NEXT
2.	LEAN	LEAD	LEAK	27.	FLAP	FLAT	FLANK
3.	HASH	HATCH	HAD	28.	SEEM	CEASE	SEAT
4.	SPEECH	SPEAK	SPEED	29.	KEEP	KEEN	KEYS
5.	GROSS	GROVE	GROPE	30.	WISH	WIND	WING
6.	RUST	BUDGE	BUMP	31.	CLASP	CLAP	CLAMP
7.	READ	REEL	REACH	32.	SOME	SUMP	SUCH
8.	SLAB	SLAP	SLAM	33.	PATH	PAD	PAST
9.	HANG	HALF	HAVE	34.	BLADE	BLAZE	BLAME
10.	CHASE	CHANGE	CHAIN	35.	FAT	FAN	FAST
11.	GRAZE	GREAT	GRADE	36.	LOOSE	LUBE	LOOP
12.	TRIP	TRIM	TRICK	37.	CHAP	CHAFF	CHAT
13.	CREEP	CREAM	CREEK	38.	FEET	FIELD	FEED
14.	PHASE	FACE	FADE	39.	CRAMPED	CRACKED	CRASHED
15.	SUN	SUNK	SUB	40.	HOSE	HOLD	HOME
16.	PLATE	PLACE	PLANE	41.	NODE	NOSE	NOTE
17.	CASE	CAME	CAGE	42.	GATE	GAZE	GAIN
18.	CHICKS	CHIPS	CHILLS	43.	FIFTH	FILL	FIN
19.	SLACK	SLASH	SLANT	44.	SKIM	SKID	SKIP
20.	LESS	LED	LEG	45.	PACE	PAVE	PAYS
21.	MAZE	MAKE	MAIN	46.	MALE	MADE	MATE
22.	RAID	RATE	RAISE	47.	GUNS	GULPS	GULLS
23.	HUNG	HUT	HUNT	48.	MIST	MIX	MID
24.	JUDGE	JUNK	JUMP	49.	LIFT	LINK	LID
25.	LAP	LAND	LATCH	50.	SURF	SURGE	SEARCH

SCORE 2% for each word (All correct - 100%) SCORE:_____% Examiner's initials

TEST 3 -- EXAMINER'S TEST SHEET

PHRASE SET 1 (page 1 of 2)

1. Begin your BOMB RUN at twenty-five hundred feet.
2. Careful of turbulence due to PROP WASH.
3. Increase power to reduce SINK RATE.
4. Move lever to WHEELS UP position.
5. TURN LEFT to course two one zero.
6. Would you repeat time of HIGH TIDE.
7. Attempt to hold FAST CRUISE flight.
8. Pull the MAIN SWITCH on the left.
9. Use caution when passing the TRIM PAD.
10. This is TEST FLIGHT two four zero.
11. Careful to check PINS OUT.
12. Attempt to SLOW DOWN airspeed.
13. Insure that BOMB BAY is clear.
14. You are OFF COURSE, correct to the right.
15. Look on the LEFT SIDE of the console.
16. It should be a DOWN HILL run from here.
17. Use UHF master control on the RIGHT SIDE.
18. The FREEZE LINE is fifty miles south of base.
19. Ask vehicle to DIM LIGHTS.
20. Main BUS BOX is below right console.
21. We have a BRISK WIND from the north.
22. BREAK OFF and climb to fifteen thousand.
23. You are SOUTH WEST of the field.
24. I see an AIR PLANE at four o'clock, three miles.
25. Reduce AIR SPEED to three fifty knots.

PHRASE SET 1 (page 2 of 2)

26. We have LIGHT SNOW with mild wind.
27. Extend lever into LOW BOOST range.
28. You should encounter CLOUD LAYER at eight thousand.
29. I have the CHASE PLANE in sight.
30. Adjust prop to LOW PITCH.
31. The GAS GAUCE appears to be faulty.
32. Come to NEW COURSE of two six zero.
33. I see GUN FIRE on the left at one mile.
34. It appears to be a PROP JET aircraft.
35. See if you can get an AIR START.
36. Do you have your PINS OUT?
37. Below GLIDE PATH, adjust rate of descent.
38. Retract TAIL HOOK into locked position.
39. Execute a SLOW ROLL to the left.
40. You can expect a fifty knot HEAD WIND.
41. Use the HAND CRANK, if necessary.
42. That's a NO JOY.
43. I am picking up GROUND FIRE.
44. After climb out, BREAK LEFT.
45. You should encounter CALM WIND above.
46. I passed through CLEAR AIR during climb out.
47. Move prop control to HIGH PITCH.
48. Do you have SAFE GUNS?
49. BREAK RIGHT after climb out.
50. You are ON COURSE, slightly above glide path.

TEST 3

PHRASE SET 2 (page 1 of 2)

1. Execute MID COURSE correction.
2. Caution, TAKE CARE when taxiing by tanker.
3. Attempt to HOLD COURSE throughout descent.
4. She attempts to slide off when I BANK RIGHT.
5. Move the switch into the HOT MIKE position.
6. I do not have the DRAG CHUTE in sight.
7. We have heavy fog with LIGHT MIST.
8. Make a TIGHT TURN to the right.
9. SET COURSE to two seven zero.
10. Reduce power and maintain SLOW CRUISE.
11. ON TOP at twenty-one thousand.
12. I do not have a GEAR UP condition.
13. We have a hold on your FLIGHT PLAN.
14. We have fog and LIGHT HAZE.
15. Am encountering MILD CHOP.
16. The clouds tend to BREAK UP over to the left.
17. Check CODE BOOK for proper identification.
18. We have ten minutes before DAY BREAK.
19. Engines DRINK FUEL at an excessive rate.
20. JOIN UP to the left of the flight leader.
21. Turn FLOOD LIGHT off.
22. We have DENSE FOG over the base.
23. O.K. pull FLAPS UP.
24. Rendezvous for LINK UP with tanker.
25. Validate LIVE FUSE condition.

PHRASE SET 2 (page 2 of 2)

26. Should be about five minutes to TOUCH DOWN.

27. I have a negative BLADE PITCH indication.

28. STEER COURSE three one zero.

29. It appears to have hit the TAIL WHEEL.

30. You are intersecting the BASE LEG now.

31. The CLOUD DECK extends to eighteen thousand.

32. Be advised you have a FLAT TIRE on the left main gear.

33. We have dense smoke in the FLIGHT DECK.

34. On my command, DUMP STORES.

35. Do not place BOARDS OUT above three hundred and fifty knots.

36. There's a BIG BLOW off to the west.

37. The FUEL FLOW indicator is defective.

38. Attempt to DUMP FUEL over the water.

39. I am encountering LIGHT RAIN.

40. Do you have a target SOUTH BOUND at four miles?

41. The AIR BRAKE will not extend.

42. On my command, execute a LEFT TURN.

43. We can expect HIGH WIND after sunset.

44. Do not attempt a SIDE SLIP.

45. Your target is to the left of the large ICE BERG.

46. You can expect THICK CLOUDS with intermittent showers.

47. Give me HALF FLAPS.

48. Check to see that LAP BELT is secure.

49. Form up with aircraft headed NORTH WEST.

50. You are cleared to depart active at NEXT TURN.

TEST 3

PHRASE SET 3 (page 1 of 2)

1. We have a CODE THREE on board.
2. You are on final at FOUR MILES.
3. Execute a WIDE TURN to the right.
4. Tower, give me a TIME HACK.
5. Fuel is expended from DROP TANKS.
6. Go ahead and WARM UP radar.
7. Four-six-zero, FORM RIGHT.
8. I am unable to maintain HIGH BOOST.
9. The target area is completely BURNED OUT.
10. The SQUALL LINE is just north of the base.
11. I have three gears LOCKED DOWN.
12. I am approaching COAST LINE.
13. Pass to the FRONT SIDE of the vehicle.
14. Look below left main WHEEL WELL.
15. Did you meet your BLOCK TIME?
16. Next to the left FUSE BOX.
17. You are slightly below FLIGHT PATH.
18. Put your FACE PLATE down.
19. Traffic is WEST BOUND at two miles.
20. Retract SPEED BRAKE and recycle gear.
21. Perform a SPLIT-S maneuver.
22. Just passing the FAR SIDE of the field.
23. I am close to having DRY TANKS.
24. Perform a SNAP ROLL to the right.
25. We have a FLAME OUT on number two.

PHRASE SET 3 (page 2 of 2)

26. Do not exceed FIVE G's.

27. Careful during descent, we have a CALM SEA.

28. The STORM LINE is fifty miles south.

29. I was AIR BORNE at fifteen-thirty.

30. Affirmative, it belongs to an AIR LINE.

31. It is powered by FAN JET engines.

32. You are slightly on the HIGH SIDE.

33. About to intersect the DOG LEG.

34. Move up and FORM LEFT of leader.

35. BANK LEFT and you can see it.

36. It appears to be a defective FUEL PUMP.

37. Give me FULL FLAPS.

38. Start your RUN UP on my command.

39. Passed below me at FULL SPEED.

40. Try to KEEP PACE with lead ship.

41. Execute a RIGHT TURN at next taxi-way.

42. Fuel in WING TANKS is expended.

43. Just west of the SHORE LINE.

44. Follow in a STEEP TURN to the left.

45. THANK YOU for your assistance.

46. Check breaker on BLEED AIR mechanism.

47. I have THREE LIGHTS in the green.

48. Careful to KEEP CLEAR of exhaust.

49. Remove safety and CHARGE GUNS.

50. Five hundred feet above TREE TOPS.

TEST 3

PHRASE SET 4 (page 1 of 2)

1. Do not CHANGE SPEED during initial.
2. Wait for engine to SPOOL DOWN.
3. The FUEL FEED mechanism is faulty.
4. We will approach during LOW TIDE.
5. Thrust is on the LOW SIDE.
6. Set scope for HIGH GAIN.
7. The aircraft is twelve miles, EAST BOUND.
8. I have a red light for the NOSE GEAR.
9. Let go of the JOY STICK.
10. Your target is in the MARSH LAND.
11. Arm and blow TIP TANKS.
12. ALL's CALM to the southwest.
13. The HATCH CLOSED, but I have a red light.
14. Attempt to contact WING MAN again.
15. Lightning off to the NORTH EAST.
16. Give me a SLOW COUNT.
17. Unable to FILL TANKS.
18. Off to the LEFT FLANK.
19. Break off if you DRAW FIRE.
20. Make a LOW RUN over the area.
21. Remove safety and ARM GUNS.
22. Remove FACE MASK and check hose.
23. I see a BRIGHT LIGHT below and to the left.
24. Lower airspeed and put GEAR DOWN.
25. Park on EAST SIDE of ramp.

TEST 3

PHRASE SET 4 (page 2 of 2)

26. Do not park DOWN WIND from sprayers.

27. Thanks for assistance, GOOD BYE.

28. Put BRAKE OUT to control airspeed.

29. The DOME LIGHT is not operating.

30. O.K. number six, YOU'RE HOT.

31. Begin evasive maneuver when IN RANGE.

32. I have the HOOK DOWN and locked.

33. My instruments indicate DRY TANKS.

34. He is on final with WHEELS DOWN.

35. Do you have visual on NORTH BOUND traffic.

36. I have ice build-up on PORT SIDE.

37. You're number two following LEAD SHIP.

38. I see the FUEL POD on the right.

39. I have an unsafe indication for the right MAIN GEAR.

40. Go ahead and put FLAPS DOWN.

41. Try to pull up with minimum G-FORCE.

42. Attempt once more to PURGE TANKS.

43. Your pigeons are in HOME PLATE.

44. Give me a CALL BACK on channel five.

45. DROP DOWN to ten thousand feet.

46. Contact squadron before you SHUT DOWN.

47. Just a little further, you are in HOME STRETCH.

48. The left windshield is ICED UP.

49. I will enter area from SOUTH EAST.

50. The FUEL GAUGE indicates six hundred pounds.

Single-syllable words. Tests 1 and 2 contain single-syllable words, each test consisting of three 50-word lists. The three lists of words on Test 1 are arranged by terminal rhyme; for example, No. 1 items for lists 1, 2, and 3 are "late, rate, and date." The lists on Test 2 are arranged by frontal rhyme; for example, No. 1 items are "late, laid, and lane."

The answer sheets are marked by the subject and scored by the aeromedical evaluator. The Test 1 answer sheet can be used for any list on Test 1, and the Test 2 answer sheet for any list on Test 2.

Two-word phrases. Test 3 contains four sets of phrases (50 phrases in each set) to be used by the aeromedical evaluator. These phrases were prepared by selecting two-word elements (two single-syllable words) from actual recorded communications. For example, the two-word element of "south west" was used to derive the phrase "You are SOUTH WEST of the field." Each phrase usually can be repeated in less than 3 seconds, using a speaking rate of approximately 120-180 words per minute (normal for males).

General guidance

Many variables beyond those associated with the hearing function of the person being tested can influence test results. The aeromedical evaluator must be aware of at least certain of these variables, such as how the individual enunciates, the characteristics of the microphone and intercom, the output level, the degree of masking present within the aircraft as well as background noise under the headset, the condition of the headsets, and if the listener has any auditory fatigue (temporary threshold shift) as a result of previous noise exposure. Although the evaluator cannot be expected to control all these variables, he must be aware that they may affect the final test result. Our experience has shown that ambient noise will not significantly affect the test results as long as the subject has well-fitted headsets and has control of the volume of the signals he receives. For example, when a person who flies an F-4E aircraft is tested in a C-131E, the difference in the ambient noise will not significantly influence his discrimination.

The recommendations below should be followed as closely as possible:

1. The aeromedical evaluator should have a minimum of 50 flying hours during which he has monitored voice communications so that he has "learned" to understand their use in flight.

2. One complete testing sequence requires approximately 13 minutes. If possible, the tests should be administered aboard a multiplace aircraft where the intercom can be used for at least 15 minutes without interfering with the operation of the aircraft. The individual being tested should not be in primary control of the aircraft during the testing period.

3. The evaluator and the subject should use standard Air Force communication headsets and microphones. If an oxygen mask is not required, the H-157 headset (gray) should be used; if an oxygen mask and crash helmet are required, the standard mask fitted with an AIC-M-101 noise-cancelling microphone and the HGU-2A/P helmet fitted with H-154 headsets should be used. The evaluator should ensure that both his and the subject's devices are properly fitted and in good repair, with the microphone positioned so that the speaker can "kiss the microphone." Earplugs should not be worn by either the evaluator or the subject during the testing. Prior to flight, the intercom, including the side tone supplied via the intercom units, should be checked to ensure that it is working properly and that sufficient gain (volume) is available.

4. The tests should be administered in a location as close to the flight deck as possible (ideally on the flight deck) so that the evaluator as well as the flightcrew can be more readily aware of what is going on and prevent compromise of flight safety.

5. Preferably, testing should be done during daylight flights and in areas where the lighting is adequate for the examiner to easily read the tests and the subject to mark his answers. If testing must be accomplished at night, the examiner should have two flashlights with red lenses to provide proper illumination without interfering with the flightcrew.

6. Tests should be administered (approximately 15 minutes) only during conditions of level flight and normal cruise. All systems (air-conditioning, pressurization, etc.) should be operated normally, and if possible, the commander should request radio silence and attempt to fly within a secure air space during the testing period. Prior to flight, the aircraft commander and the evaluator should establish precise guidelines about the use of the intercom during the test period. The evaluator must know when incoming UHF or VHF messages require that he maintain silence so that he never compromises flight safety. Usually, the problem of interrupting UHF and/or VHF transmissions can be avoided by letting ground control know of the need for radio silence and maintaining a radar-controlled orbiting flight profile.

7. The evaluator should use a "hot mike" during all tests, and during Test 3 (phrases), the hot mike is required for the subject as well. If the microphone circuit must be keyed, care must be taken so that all acoustic elements of the test materials are clearly audible and not abbreviated nor cut out by improper use of the microphone button.

8. The evaluator should "dry run" the procedures so that the actual testing can be accomplished in a professional manner. Preferably, the dry run should be performed in the aircraft that will be used for the test. The subject selected for the dry run should be accustomed to listening to in-flight communications. The value of practice cannot be overemphasized, since the aeromedical evaluator must be familiar with using the test materials and feel confidence while administering the tests. The dry run should be considered separate from tests performed to establish the range of pass-fail scores (See "Determining adequacy of hearing.")

Specific guidance

Tests to be accomplished. Generally, three tests are required:

1. One word list from Test 1,
2. One word list from Test 2, and
3. One phrase set from Test 3.

This selection provides three separate lists of materials to be used during the actual evaluation.

Responses. Responses to Tests 1 and 2 are recorded on the proper answer sheets by simply marking through the word heard. Responses to Test 3 can be evaluated by noting whether or not the subject correctly repeats the essential content of each phrase. The subject need not repeat the entire message, but he should respond with enough information to clearly indicate that he understood the basic content of the phrase. For example, if the phrase read was "You are off course, correct to the right," then the response "off course, correct right" would be considered adequate. Answer sheets are not required for the phrases; the evaluator need only record the number of incorrect responses and then compute the score (2% for each phrase).

Presentation of tests. Before beginning the actual testing, the volume control of the intercom unit should be checked to ensure clearly audible speech reception. Also, the master gain of the intercom unit used by the subject should be adjusted so that an adequate signal is available. The evaluator should read the following passage while the subject adjusts the gain of his intercom receiver:

> "The United States Air Force uses a variety of aircraft to accomplish different missions. For example, the Tactical Air Command uses aircraft, such as the F-100 and the F-4, to provide close ground support as well as control of the air in the vicinity of friendly ground forces."

If necessary, additional general material can be read so that the subject has an adequate sample of speech to determine his best listening level. The signal should be loud enough to be easily heard, but not so loud that aural distortions occur.

The single-syllable words must be pronounced clearly. Each word is preceded by the appropriate identification number (e.g., No. 1--"date"), with a slight pause between the identification number and the test word. Approximately 3 seconds should be allowed for the subject to cross through the word he chooses from the three words provided on the answer sheet. Words should not be repeated. If the test word should be made nonintelligible by intrusion of extraneous interruptions, simply go to the next word

(in sequence) and do not score the interrupted word as a miss. Do not give the subject a direct feedback concerning the correctness of his response. Generally, each of the 50 single-syllable word lists can be accomplished in 4-5 minutes.

After Tests 1 and 2 are completed, one of the four phrase sets will be administered to the subject. In scoring the responses to the phrases (Test 3), the evaluator must listen closely and determine the adequacy of each response. As with the single-syllable words, no direct feedback of the accuracy of the subject's responses will be given.

Scoring responses. Each single-syllable word list is scored separately, and each correct response counts 2%. For example, if there were four incorrect responses, the score for the entire list of 50 words would be 92%. The phrase sets are scored in the same way.

Reporting results

A format is given below for reporting results of testing, along with other pertinent information. Results from aircrewmen with both normal and subnormal hearing (by standard testing evaluations) should be reported so that evaluations and revisions of this in-flight assessment can be made.

It is requested that the following information be submitted to USAFSAM/NGEA, Brooks AFB, TX 78235.

Examiner: Autovon No.:

Type aircraft used:

Name of subject: Age: AFSN:

Total flying time: AFSC:

Audiometric results: Freq. (Hz) 500 1000 2000 3000 4000 6000

Right ear:

Left ear:

In-flight test scores (list as appropriate):

TEST 1: List 1 _____ List 2 _____ List 3 _____

TEST 2: List 1 _____ List 2 _____ List 3 _____

TEST 3: Phrase 1 _____ Phrase 2 _____ Phrase 3 _____ Phrase 4 _____

Range of scores examiner obtained among normal-hearing flying personnel:

Remarks:

Determining adequacy of hearing

The purpose of the in-flight hearing test is to determine the ability of aircrewmen to receive and understand speech signals during aircraft operation. The final decision is a clinical determination. The materials and procedures described in this report are intended to assist aeromedical evaluators in accomplishing this task. Until this test is validated, each evaluator should establish the range of scores elicited on at least five experienced flyers with Class II (or better) hearing. These scores can then serve as a guide and establish an acceptable control/normal range.

A rapid, uncomplicated statistical procedure described by Dixon and Massey (6) may be used to determine if a particular flyer's score on the test is significantly poorer than scores yielded by the normal hearing group. This procedure would be used only when the flyer with questionable hearing has a score on this test that is poorer than all the scores from the normal-hearing (control) persons. If the subject scores better than any of the normals, he is unquestionably performing in a normal manner. However, if he scores poorer than all the normals, a determination must be made as to how significant the difference is. The exact procedure is to (1) subtract the subject's score from the lowest score made by a normal listener, (2) subtract the subject's score from the highest score made by a normal listener, (3) compute the ratio of the two values yielded in steps 1 and 2, and (4) compare the ratio to a criterion value. If five normal-hearing flyers are in the control group, then a criterion ratio of .560 can be used to achieve a significance level of 5% (table A-8e, Dixon and Massey)(6). That is, a resultant ratio of .560 or larger indicates that the subject's score was significantly poorer than scores from the known normal group; conversely, a ratio less than .560 indicates that the subject's score is not significantly different from the normals. For example, if five normal-hearing flyers scored 94%, 88%, 100%, 98%, and 90% and a flyer with questionable hearing scored 72%, our calculations would be:

$$\frac{88 \text{ (lowest normal score)} - 72 \text{ (subject's score)}}{100 \text{ (highest normal score)} - 72 \text{ (subject's score)}} = \frac{16}{28} = .5714$$

The ratio (.5714) is larger than our criterion ratio (.560), so the subject's score is significantly poorer than the normal scores.

To provide an actual example, Test 1 - list 1 and Test 2 - list 1 were administered to five normal hearing subjects who each had considerable flight experience (in excess of 2000 hrs.). The tests were conducted in a reverberation chamber with an ambient noise of 107.5 dB C-weighted and 102.5 dB A-weighted. The scores obtained from the five subjects were as follows:

	Test 1 - list 1	Test 2 - list 1
Subject 1	78%	90%
Subject 2	84%	94%
Subject 3	94%	84%
Subject 4	92%	98%
Subject 5	94%	100%

Application of the statistical procedure revealed that for a subject with questionable hearing, 58% on test 1 would be passing while 56% would be failing.

$$\frac{78 - 58}{94 - 58} = \frac{20}{36} = .556 \text{ (Passing)}$$

and

$$\frac{78 - 56}{94 - 56} = \frac{22}{38} = .579 \text{ (Failing)}$$

On Test 2, a score of 64% would be passing while 62% would be failing.

$$\frac{84 - 64}{100 - 64} = \frac{20}{36} = .556 \text{ (Passing)}$$

and

$$\frac{84 - 62}{100 - 62} = \frac{22}{38} = .579 \text{ (Failing)}$$

This statistical procedure should not be used without reservation. For example, if all normal subjects scored 100%, then a score of 98% from another subject would be failing if the formula was used literally. A reasonable approach would be to consider any score of 90% or more as passing, even though the criterion ratio is exceeded when the scores are processed. In addition, test results should simply be further information to use in arriving at a clinical judgment as to whether or not a waiver for hearing loss should be recommended. This test should not be used as the ultimate basis for making that decision.

If conditions change so that the previous normal scores are no longer considered valid, a new group of five normal-hearing flyers should be tested. This validity could be lost if a gross change occurred in conditions under which the test is given. For instance, if normal scores are obtained in the cargo area of a reciprocating engine aircraft and it becomes necessary to test in the cockpit of a jet fighter aircraft, it may be necessary to establish normal scores under the new conditions. Any test condition change that might make scores generally poorer or generally better calls for establishing a new set of normal results.

III. CONCLUSIONS AND RECOMMENDATIONS

The materials and procedures described in this report have been carefully selected and are proposed for in-flight assessment of the auditory function of aircrewmen. Their value can be determined only by application and appraisal of results.

We propose an in-flight hearing test that consists of five phases of development. The first three phases are dealt with in this report: selecting test materials, arranging these materials for standardized administration, and establishing tentative pass-fail criteria. The fourth phase of development must be accomplished by aeromedical evaluators who perform the tests and report their findings to the authors so that the final phase of the task can be accomplished, namely, revision and modification of materials, procedures, and criterion so that standardization of the method can be achieved. Since this final phase can be completed only after information is obtained from persons who have actually used the test materials, medical evaluators who use the test materials are urged to report their results so that realistic pass-fail criteria can be established and materials and procedures can be standardized. Test results obtained on aircrewmen with normal hearing should be reported as well as data on subjects with hearing loss.

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APPENDIX

SAMPLE TESTS AND REPORT SHEET

FOR USE BY EVALUATORS

TEST 1 -- EXAMINER'S TEST SHEET

List 1		List 2		List 3	
1.	LATE	1.	RATE	1.	DATE
2.	PUMP	2.	BUMP	2.	DUMP
3.	KEEP	3.	BEEP	3.	DEEP
4.	BASE	4.	RACE	4.	CASE
5.	RUT	5.	CUT	5.	NUT
6.	BLIP	6.	SHIP	6.	FLIP
7.	HAZE	7.	BLAZE	7.	RAISE
8.	CHOP	8.	STOP	8.	FLOP
9.	LUMP	9.	SUMP	9.	CLUMP
10.	DIP	10.	RIP	10.	SKIP
11.	DASH	11.	FLASH	11.	CRASH
12.	FILL	12.	SPILL	12.	STILL
13.	FIVE	13.	LIVE	13.	DIVE
14.	FLAP	14.	SLAP	14.	SNAP
15.	GUN	15.	SUN	15.	RUN
16.	GEAR	16.	NEAR	16.	REAR
17.	PURGE	17.	SURGE	17.	MERGE
18.	LATCH	18.	HATCH	18.	BATCH
19.	GROUP	19.	SWOOP	19.	LOOP
20.	JET	20.	GET	20.	WET
21.	HULL	21.	NULL	21.	GULL
22.	HOOK	22.	LOOK	22.	CROOK
23.	PHASE	23.	DAZE	23.	PAYS
24.	CAGE	24.	STAGE	24.	PAGE
25.	CODE	25.	LOAD	25.	NODE
26.	CALL	26.	STALL	26.	FALL
27.	LOG	27.	FOG	27.	SMOG
28.	PITCH	28.	WHICH	28.	DITCH
29.	LAST	29.	BLAST	29.	FAST
30.	MIKE	30.	STRIKE	30.	LIKE
31.	POD	31.	SOD	31.	ROD
32.	SEAT	32.	FLEET	32.	NEAT
33.	SIGHT	33.	RIGHT	33.	LIGHT
34.	SCOPE	34.	SLOPE	34.	GROPE
35.	SLIP	35.	GRIP	35.	STRIP
36.	SPEED	36.	NEED	36.	BLEED
37.	TAKE	37.	BRAKE	37.	LAKE
38.	SENT	38.	VENT	38.	WENT
39.	DECK	39.	SPECK	39.	WRECK
40.	CLASH	40.	BASH	40.	TRASH
41.	DWELL	41.	SWELL	41.	SMELL
42.	MADE	42.	BLADE	42.	FADE
43.	WILL	43.	KILL	43.	HILL
44.	REELS	44.	FEELS	44.	MEALS
45.	SCAN	45.	SPAN	45.	FAN
46.	COARSE	46.	FORCE	46.	SOURCE
47.	RIDE	47.	SLIDE	47.	GUIDE
48.	RED	48.	HEAD	48.	LED
49.	LOCKED	49.	CLOCKED	49.	BLOCKED
50.	MIST	50.	LIST	50.	TWIST

TEST 2 -- EXAMINER'S TEST SHEET

List 1	List 2	List 3
1. LATE	1. LAID	1. LANE
2. LEAN	2. LEAD	2. LEAK
3. HAD	3. HATCH	3. HASH
4. SPEED	4. SPEECH	4. SPEAK
5. GROSS	5. GROPE	5. GROVE
6. BUST	6. BUDGE	6. BUMP
7. REEL	7. READ	7. REACH
8. SLAP	8. SLAM	8. SLAB
9. HALF	9. HAVE	9. HANG
10. CHASE	10. CHANGE	10. CHAIN
11. GRADE	11. GRAZE	11. GREAT
12. TRIP	12. TRICK	12. TRIM
13. CREEP	13. CREAM	13. CREEK
14. FADE	14. PHASE	14. FACE
15. SUN	15. SUNK	15. SUB
16. PLACE	16. PLANE	16. PLATE
17. CAME	17. CASE	17. CAGE
18. CHICKS	18. CHIPS	18. CHILLS
19. SLANT	19. SLASH	19. SLACK
20. LEG	20. LED	20. LESS
21. MAZE	21. MAIN	21. MAKE
22. RAISE	22. RAID	22. RATE
23. HUT	23. HUNG	23. HUNT
24. JUDGE	24. JUNK	24. JUMP
25. LATCH	25. LAND	25. LAP
26. NET	26. NEST	26. NEXT
27. FLANK	27. FLAP	27. FLAT
28. SEAT	28. SEEM	28. CEASE
29. KEEN	29. KEEP	29. KEYS
30. WISH	30. WIND	30. WING
31. CLASP	31. CLAMP	31. CLAP
32. SUMP	32. SUCH	32. SOME
33. PATH	33. PAD	33. PAST
34. BLADE	34. BLAZE	34. BLAME
35. FAN	35. FAT	35. FAST
36. LOOSE	36. LOOP	36. LUBE
37. CHAFF	37. CHAP	37. CHAT
38. FEET	38. FIELD	38. FEED
39. CRASHED	39. CRACKED	39. CRAMPED
40. HOLD	40. HOSE	40. HOME
41. NODE	41. NOTE	41. NOSE
42. GATE	42. GAZE	42. GAIN
43. FIN	43. FILL	43. FIFTH
44. SKIP	44. SKIM	44. SKID
45. PACE	45. PAVE	45. PAYS
46. MADE	46. MATE	46. MALE
47. GULPS	47. GUNS	47. GULLS
48. MIST	48. MIX	48. MID
49. LID	49. LINK	49. LIFT
50. SURF	50. SURGE	50. SEARCH

TEST 1 -- ANSWER SHEET

SSAN:_____
NAME:_____ DATE:_____

INSTRUCTIONS: Mark through word heard. If not certain, guess.

List No._____

1.	LATE	DATE	RATE	26.	STALL	FALL	CALL
2.	DUMP	PUMP	BUMP	27.	LOG	SMOG	FOG
3.	BEEP	KEEP	DEEP	28.	DITCH	WHICH	PITCH
4.	RACE	BASE	CASE	29.	BLAST	LAST	FAST
5.	RUT	CUT	NUT	30.	MIKE	STRIKE	LIKE
6.	FLIP	BLIP	SHIP	31.	POD	SOD	ROD
7.	BLAZE	HAZE	RAISE	32.	NEAT	SEAT	FLEET
8.	STOP	FLOP	CHOP	33.	SIGHT	RIGHT	LIGHT
9.	LUMP	CLUMP	SUMP	34.	GROPE	SLOPE	SCOPE
10.	SKIP	DIP	RIP	35.	GRIP	SLIP	STRIP
11.	DASH	CRASH	FLASH	36.	NEED	SPEED	BLEED
12.	STILL	FILL	SPILL	37.	TAKE	LAKE	BRAKE
13.	FIVE	DIVE	LIVE	38.	SENT	VENT	WENT
14.	SLAP	SNAP	FLAP	39.	WRECK	SPECK	DECK
15.	SUN	RUN	GUN	40.	TRASH	CLASH	BASH
16.	GEAR	REAR	NEAR	41.	SWELL	SMELL	DWELL
17.	SURGE	PURGE	MERGE	42.	FADE	BLADE	MADE
18.	BATCH	HATCH	LATCH	43.	WILL	HILL	KILL
19.	GROUP	SWOOP	LOOP	44.	FEELS	REELS	MEALS
20.	GET	JET	WET	45.	SCAN	FAN	SPAN
21.	NULL	GULL	HULL	46.	COARSE	FORCE	SOURCE
22.	HOOK	CROOK	LOOK	47.	SLIDE	GUIDE	RIDE
23.	PAYS	DAZE	PHASE	48.	LED	HEAD	RED
24.	STAGE	CAGE	PAGE	49.	CLOCKED	BLOCKED	LOCKED
25.	CODE	LOAD	NODE	50.	MIST	TWIST	LIST

SCORE 2% for each word (All correct - 100%) SCORE_____% Examiner's initials_____

TEST 2 -- ANSWER SHEET

SSAN:_____
NAME:_____ DATE:_____

INSTRUCTIONS: Mark through word heard. If not certain, guess.

List No._____

1.	LAID	LATE	LANE	26.	NET	NEST	NEXT
2.	LEAN	LEAD	LEAK	27.	FLAP	FLAT	FLANK
3.	HASH	HATCH	HAD	28.	SEEM	CEASE	SEAT
4.	SPEECH	SPEAK	SPEED	29.	KEEP	KEEN	KEYS
5.	GROSS	GROVE	GROPE	30.	WISH	WIND	WING
6.	BUST	BUDGE	BUMP	31.	CLASP	CLAP	CLAMP
7.	READ	REEL	REACH	32.	SOME	SUMP	SUCH
8.	SLAB	SLAP	SLAM	33.	PATH	PAD	PAST
9.	HANG	HALF	HAVE	34.	BLADE	BLAZE	BLAME
10.	CHASE	CHANGE	CHAIN	35.	FAT	FAN	FAST
11.	GRAZE	GREAT	GRADE	36.	LOOSE	LUBE	LOOP
12.	TRIP	TRIM	TRICK	37.	CHAP	CHAFF	CHAT
13.	CREEP	CREAM	CREEK	38.	FEET	FIELD	FEED
14.	PHASE	FACE	FADE	39.	CRAMPED	CRACKED	CRASHED
15.	SUN	SUNK	SUB	40.	HOSE	HOLD	HOME
16.	PLATE	PLACE	PLANE	41.	NODE	NOSE	NOTE
17.	CASE	CAME	CAPE	42.	GATE	GAZE	GAIN
18.	CHICKS	CHIPS	CHILLS	43.	FIFTH	FILL	FIN
19.	SLACK	SLASH	SLANT	44.	SKIM	SKID	SKIP
20.	LESS	LED	LEG	45.	PACE	PAVE	PAYS
21.	MAZE	MAKE	MAIN	46.	MALE	MADE	MATE
22.	RAID	RATE	RAISE	47.	GUNS	GULPS	GULLS
23.	HUNG	HUT	HUNT	48.	MIST	MIX	MID
24.	JUDGE	JUNK	JUMP	49.	LIFT	LINK	LID
25.	LAP	LAND	LATCH	50.	SURF	SURGE	SEARCH

SCORE 2% for each word (All correct - 100%) SCORE:_____% Examiner's initials

TEST 3 -- EXAMINER'S TEST SHEET

PHRASE SET 1 (page 1 of 2)

1. Begin your BOMB RUN at twenty-five hundred feet.
2. Careful of turbulence due to PROP WASH.
3. Increase power to reduce SINK RATE.
4. Move lever to WHEELS UP position.
5. TURN LEFT to course two one zero.
6. Would you repeat time of HIGH TIDE.
7. Attempt to hold FAST CRUISE flight.
8. Pull the MAIN SWITCH on the left.
9. Use caution when passing the TRIM PAD.
10. This is TEST FLIGHT two four zero.
11. Careful to check PINS OUT.
12. Attempt to SLOW DOWN airspeed.
13. Insure that BOMB BAY is clear.
14. You are OFF COURSE, correct to the right.
15. Look on the LEFT SIDE of the console.
16. It should be a DOWN HILL run from here.
17. Use UHF master control on the RIGHT SIDE.
18. The FREEZE LINE is fifty miles south of base.
19. Ask vehicle to DIM LIGHTS.
20. Main BUS BOX is below right console.
21. We have a BRISK WIND from the north.
22. BREAK OFF and climb to fifteen thousand.
23. You are SOUTH WEST of the field.
24. I see an AIR PLANE at four o'clock, three miles.
25. Reduce AIR SPEED to three fifty knots.

PHRASE SET 1 (page 2 of 2)

26. We have LIGHT SNOW with mild wind.
27. Extend lever into LOW BOOST range.
28. You should encounter CLOUD LAYER at eight thousand.
29. I have the CHASE PLANE in sight.
30. Adjust prop to LOW PITCH.
31. The GAS GAUGE appears to be faulty.
32. Come to NEW COURSE of two six zero.
33. I see GUN FIRE on the left at one mile.
34. It appears to be a PROP JET aircraft.
35. See if you can get an AIR START.
36. Do you have your PINS OUT?
37. Below GLIDE PATH, adjust rate of descent.
38. Retract TAIL HOOK into locked position.
39. Execute a SLOW ROLL to the left.
40. You can expect a fifty knot HEAD WIND.
41. Use the HAND CRANK, if necessary.
42. That's a NO JOY.
43. I am picking up GROUND FIRE.
44. After climb out, BREAK LEFT.
45. You should encounter CALM WIND above.
46. I passed through CLEAR AIR during climb out.
47. Move prop control to HICH PITCH.
48. Do you have SAFE GUNS?
49. BREAK RIGHT after climb out.
50. You are ON COURSE, slightly above glide path.

TEST 3

PHRASE SET 2 (page 1 of 2)

1. Execute MID COURSE correction.
2. Caution, TAKE CARE when taxiing by tanker.
3. Attempt to HOLD COURSE throughout descent.
4. She attempts to slide off when I BANK RIGHT.
5. Move the switch into the HOT MIKE position.
6. I do not have the DRAG CHUTE in sight.
7. We have heavy fog with LIGHT MIST.
8. Make a TIGHT TURN to the right.
9. SET COURSE to two seven zero.
10. Reduce power and maintain SLOW CRUISE.
11. ON TOP at twenty-one thousand.
12. I do not have a GEAR UP condition.
13. We have a hold on your FLIGHT PLAN.
14. We have fog and LIGHT HAZE.
15. Am encountering MILD CHOP.
16. The clouds tend to BREAK UP over to the left.
17. Check CODE BOOK for proper identification.
18. We have ten minutes before DAY BREAK.
19. Engines DRINK FUEL at an excessive rate.
20. JOIN UP to the left of the flight leader.
21. Turn FLOOD LIGHT off.
22. We have DENSE FOG over the base.
23. O.K. pull FLAPS UP.
24. Rendezvous for LINK UP with tanker.
25. Validate LIVE FUSE condition.

PHRASE SET 2 (page 2 of 2)

26. Should be about five minutes to TOUCH DOWN.

27. I have a negative BLADE PITCH indication.

28. STEER COURSE three one zero.

29. It appears to have hit the TAIL WHEEL.

30. You are intersecting the BASE LEG now.

31. The CLOUD DECK extends to eighteen thousand.

32. Be advised you have a FLAT TIRE on the left main gear.

33. We have dense smoke in the FLIGHT DECK.

34. On my command, DUMP STORES.

35. Do not place BOARDS OUT above three hundred and fifty knots.

36. There's a BIG BLOW off to the west.

37. The FUEL FLOW indicator is defective.

38. Attempt to DUMP FUEL over the water.

39. I am encountering LIGHT RAIN.

40. Do you have a target SOUTH BOUND at four miles?

41. The AIR BRAKE will not extend.

42. On my command, execute a LEFT TURN.

43. We can expect HIGH WIND after sunset.

44. Do not attempt a SIDE SLIP.

45. Your target is to the left of the large ICE BERG.

46. You can expect THICK CLOUDS with intermittent showers.

47. Give me HALF FLAPS.

48. Check to see that LAP BELT is secure.

49. Form up with aircraft headed NORTH WEST.

50. You are cleared to depart active at NEXT TURN.

TEST 3

PHRASE SET 3 (page 1 of 2)

1. We have a CODE THREE on board.
2. You are on final at FOUR MILES.
3. Execute a WIDE TURN to the right.
4. Tower, give me a TIME HACK.
5. Fuel is expended from DROP TANKS.
6. Go ahead and WARM UP radar.
7. Four-six-zero, FORM RIGHT.
8. I am unable to maintain HIGH BOOST.
9. The target area is completely BURNED OUT.
10. The SQUALL LINE is just north of the base.
11. I have three gears LOCKED DOWN.
12. I am approaching COAST LINE.
13. Pass to the FRONT SIDE of the vehicle.
14. Look below left main WHEEL WELL.
15. Did you meet your BLOCK TIME?
16. Next to the left FUSE BOX.
17. You are slightly below FLIGHT PATH.
18. Put your FACE PLATE down.
19. Traffic is WEST BOUND at two miles.
20. Retract SPEED BRAKE and recycle gear.
21. Perform a SPLIT-S maneuver.
22. Just passing the FAR SIDE of the field.
23. I am close to having DRY TANKS.
24. Perform a SNAP ROLL to the right.
25. We have a FLAME OUT on number two.

PHRASE SET 3 (page 2 of 2)

26. Do not exceed FIVE G's.
27. Careful during descent, we have a CALM SEA.
28. The STORM LINE is fifty miles south.
29. I was AIR BORNE at fifteen-thirty.
30. Affirmative, it belongs to an AIR LINE.
31. It is powered by FAN JET engines.
32. You are slightly on the HIGH SIDE.
33. About to intersect the DOG LEG.
34. Move up and FORM LEFT of leader.
35. BANK LEFT and you can see it.
36. It appears to be a defective FUEL PUMP.
37. Give me FULL FLAPS.
38. Start your RUN UP on my command.
39. Passed below me at FULL SPEED.
40. Try to KEEP PACE with lead ship.
41. Execute a RIGHT TURN at next taxi-way.
42. Fuel in WING TANKS is expended.
43. Just west of the SHORE LINE.
44. Follow in a STEEP TURN to the left.
45. THANK YOU for your assistance.
46. Check breaker on BLEED AIR mechanism.
47. I have THREE LIGHTS in the green.
48. Careful to KEEP CLEAR of exhaust.
49. Remove safety and CHARGE GUNS.
50. Five hundred feet above TREE TOPS.

TEST 3

PHRASE SET 4 (page 1 of 2)

1. Do not CHANGE SPEED during initial.
2. Wait for engine to SPOOL DOWN.
3. The FUEL FEED mechanism is faulty.
4. We will approach during LOW TIDE.
5. Thrust is on the LOW SIDE.
6. Set scope for HIGH GAIN.
7. The aircraft is twelve miles, EAST BOUND.
8. I have a red light for the NOSE GEAR.
9. Let go of the JOY STICK.
10. Your target is in the MARSH LAND.
11. Arm and blow TIP TANKS.
12. ALL's CALM to the southwest.
13. The HATCH CLOSED, but I have a red light.
14. Attempt to contact WING MAN again.
15. Lightning off to the NORTH EAST.
16. Give me a SLOW COUNT.
17. Unable to FILL TANKS.
18. Off to the LEFT FLANK.
19. Break off if you DRAW FIRE.
20. Make a LOW RUN over the area.
21. Remove safety and ARM GUNS.
22. Remove FACE MASK and check hose.
23. I see a BRIGHT LIGHT below and to the left.
24. Lower airspeed and put GEAR DOWN.
25. Park on EAST SIDE of ramp.

TEST 3

PHRASE SET 4 (page 2 of 2)

26. Do not park DOWN WIND from sprayers.

27. Thanks for assistance, GOOD BYE.

28. Put B\AKE OUT to control airspeed.

29. The DOME LIGHT is not operating.

30. O.K. number six, YOU'RE HOT.

31. Begin evasive maneuver when IN RANGE.

32. I have the HOOK DOWN and locked.

33. My instruments indicate DRY TANKS.

34. He is on final with WHEELS DOWN.

35. Do you have visual on NORTH BOUND traffic.

36. I have ice build-up on PORT SIDE.

37. You're number two following LEAD SHIP.

38. I see the FUEL POD on the right.

39. I have an unsafe indication for the right MAIN GEAR.

40. Go ahead and put FLAPS DOWN.

41. Try to pull up with minimum G-FORCE.

42. Attempt once more to PURGE TANKS.

43. Your pigeons are in HOME PLATE.

44. Give me a CALL BACK on channel five.

45. DROP DOWN to ten thousand feet.

46. Contact squadron before you SHUT DOWN.

47. Just a little further, you are in HOME STRETCH.

48. The left windshield is ICED UP.

49. I will enter area from SOUTH EAST.

50. The FUEL GAUGE indicates six hundred pounds.

It is requested that the following information be submitted to USAFSAM/NGEA, Brooks AFB, TX 78235.

Examiner: Autovon No.:

Type aircraft used:

Name of subject: Age: AFSN:

Total flying time: AFSC:

Audiometric results: Freq. (Hz) 500 1000 2000 3000 4000 6000

Right ear:

Left ear:

In-flight test scores (list as appropriate):

TEST 1: List 1 _____ List 2 _____ List 3 _____

TEST 2: List 1 _____ List 2 _____ List 3 _____

TEST 3: Phrase 1 _____ Phrase 2 _____ Phrase 3 _____ Phrase 4 _____

Range of scores examiner obtained among normal-hearing flying personnel:

Remarks: