Research Note 84-126

APPENDIXES TO HUMAN FACTORS ANALYSIS OF TWO PROTOTYPE ARMY MAINTENANCE TRAINING AND EVALUATION SIMULATION SYSTEM (AMTESS) DEVICES

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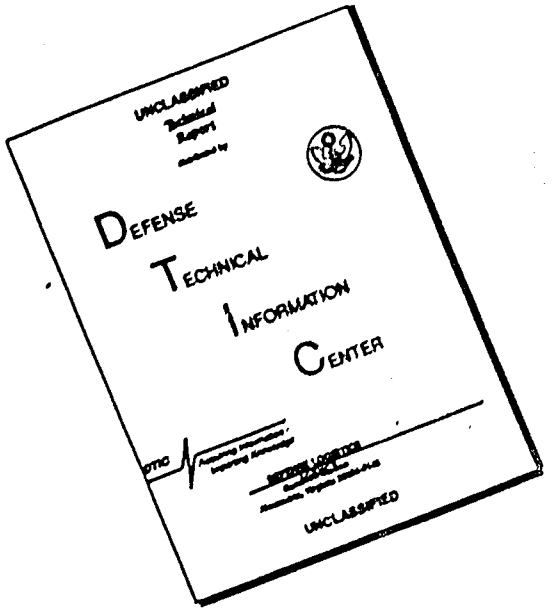

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A human factors analysis of two prototype Army Maintenance Training and Evaluation Simulation System (AMTESS) devices was conducted. A variety of analytic procedures was applied to assess the degree to which the devices met standards in the areas of hardware, software, and instructional features of the courseware. Both devices met hardware and software standards critical to the performance of their training function, but the courseware did not appear to have been designed around important learning principles. The appendixes consist of 1472G-based checklists for the Grumman and Seville/Burtek Devices. Keywords:

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This volume contains the appendixes for the report "Human Factors Analysis of Two Prototype Army Maintenance Training and Evaluation Simulation System (AMTESS) Devices."

- o Appendix A 1472C-based Checklist for the Grumman Device
- o Appendix B 1472C-based Checklist for the Seville/Burtek Device

These appendixes are to be published as an Army Research Institute Research Note.

APPENDIX A
1472C-BASED CHECKLIST FOR THE GRUMMAN DEVICE

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA CONTROL/DISPLAY INTEGRATION SECTION 5.1 (MIL-STD-1472C)

SYSTEM GRUMMAN SUBSYSTEM _____ COMPONENT _____

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.1 CONTROL/DISPLAY INTEGRATION						
5.1.1 GENERAL CRITERIA						
5.1.1.1. RELATIONSHIP						
Are relationships of controls to their associated displays, and displays to controls, immediately apparent to the operator?	X				3	
Are controls located adjacent to (normally under or to the right of) their associated displays and positioned so that neither the control nor the hand normally used for setting the control will obscure the display?	X				1	
5.1.1.2 DESIGN						
Are control-display relationships apparent to the user through proximity, similarity of groupings, coding, framing, labeling, and similar techniques?	X				1	
5.1.1.3 COMPLEXITY AND PRECISION						
Is complexity and precision required of control manipulation and display monitoring consistent with the precision required of the system?	X				2	
Does control/display complexity match the capability of the operator (in terms of discrimination of display detail), or match the operator's manipulative capability under the dynamic conditions and environment in which human performance is expected to occur?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.1.1.4 FEEDBACK						
Is feedback on control response adequacy provided as rapidly as possible?	X				2	in most cases; CRT response is sluggish at times, however
Do critical control functions, such as those entered by keyboard, provide adequate feedback to the operator prior to entry to ensure that the keyed entry is, in fact, errorless and the one that the operator desires to enter?	X				2	
5.1.2 POSITIONAL RELATIONSHIPS						
5.1.2.1 FUNCTIONAL GROUPING						
Are functionally-related controls and displays located in proximity to one another--arrange in functional groups, e.g., power, status, test, etc.?	X				2	
5.1.2.1.1 FUNCTIONAL GROUP ARRANGEMENT						
5.1.2.1.1.1 SEQUENCE						
Are functionally related groups of controls and displays located so as to provide for left-to-right (preferred) or top-to-bottom order of use, or both?	X				1	
5.1.2.1.1.2 ACCESS						
Are functionally-related groups of controls and displays which are more frequently used, located in areas of easiest access?	X				1	generally
5.1.2.1.1.3 FUNCTIONAL GROUP MARKING						
Are functional groups set apart by outlining with contrasting lines which completely encompass the groups?		X			1	but questionable relevance

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.1.2.1.1.4 CONSISTENCY						
Is the location of recurring functional groups and individual items similar from panel to panel?	X				2	
5.1.2.3 ARRANGEMENT WITHIN GROUPS						
Are controls and displays within functional groups located according to operation sequence or function, or both?	X				2	
5.1.3 MOVEMENT RELATIONSHIPS						
5.1.3.1 LACK OF AMBIGUITY						
Do display indicators clearly and unambiguously direct and guide the appropriate control response?	X				2	
Is the response of the display to control movements consistent, predictable, and compatible with the operator's expectations?	X				2	
5.1.3.2-TIME LAG						
Is the time lag between the response of the system to a control input and the display presentation of the response, minimized?	X				2	usually; however, see 5.1.1.4

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA VISUAL DISPLAYS SECTION 5.2 (MIL-STD-1472C)

SYSTEM GRUMMAN SUBSYSTEM _____ COMPONENT _____

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2 VISUAL DISPLAYS 5.2.1 GENERAL						
Are visual displays used to provide the operator with a clear indication of equipment or system conditions for operation under any eventuality commensurate with the operational and maintenance philosophy under design?	X				4	
5.2.1.1. ALERTING/WARNING RELIABILITY						
Do alerting/warning displays provide the operator with a greater probability of detecting the triggering condition than normal observation would provide in the absence of the displays?	X				3	
5.2.1.3.1 CONTENT						
Is information displayed to the operator limited to that which is necessary to perform specific ations or to make decisions?	X				3	
5.2.1.3.2 PRECISION						
Is the information displayed only within the limits and precision required for specific operator actions or decisions?	X				3	
5.2.1.3.3 FORMAT						
Is information presented to the operator in a directly usable form?	X				3	
Is the need for transposing, computing, interpolating, or mentally translating into other units avoided?	X				3	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.1.3.4 REDUNDANCY						
Is display redundancy avoided except in those circumstances where it is needed to achieve reliability?	X				1	
5.2.1.3.5 COMBINING OPERATOR/ MAINTAINER INFORMATION						
Is operator and maintainer information combined in the same display only when the information content and format are well-suited to, and time compatible for, both users?			X		—	
5.2.1.3.6 DISPLAY FAILURE CLARITY						
Is failure of a display or its circuit immediately apparent to the operator?		X			2	CRT "lockup" is not always immediately apparent to user/operator
5.2.1.3.7 DISPLAY CIRCUIT FAILURE						
Is display circuitry separate from equipment it monitors such that a failure in the display does not cause a failure in equipment?			X		—	
5.2.1.3.8 UNRELATED MARKINGS						
Are trademarks and company names placed elsewhere other than on the display panel face?	X				1	
5.2.1.3.9 DURATION						
Do signals and display information have durations of sufficient length to be reliably detected under expected operator workload and the operational environment?	X				3	
5.2.1.3.10 TIMELINESS						
Are displays such as cathode ray tube displays, head-up displays, collimated displays and other displays requiring refreshed information updated in a synchronous manner, where possible?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
Are the displays refreshed to the degree of timeliness required by personnel in the normal operating and/or servicing modes?	X				2	
5.2.1.3.11 ADVISORY AND ALERTING						
Do displays such as multifunction displays, cathode ray tube displays, head-up diplays, collimate displays and other visual display devices which display simultaneous and integrated information advise and alert operating personnel to information that becomes critical within the display?			X		—	
5.2.1.4 LOCATION AND ARRANGEMENT						
5.2.1.4.1 LOCATION						
Are displays located and designed so that they may be read to the degree of accuracy required by personnel in the normal operating or servicing positions without requiring the operator to assume an uncomfortable, awkward or unsafe position?		X			2	**Length of cable to CRT limits adjustment to most comfortable and efficient position**
5.2.1.4.2 ACCESS						
Are visual displays visually accessible without resorting to the use of ladders, flashlights or other special equipment?	X				2	
5.2.1.4.3 ORIENTATION						
Are display faces perpendicular to the operator's line of sight when feasible?	X				1	
Is parallax minimal?	X				1	
5.2.1.4.4 REFLECTION						
Are displays constructed, arranged and mounted to prevent reduction of information transfer due to reflection of the ambient illumination from the display cover?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.1.4.6 GROUPING						
Are all displays necessary to support an operator activity or sequence of activities, grouped together?	X				2	
5.2.1.4.7 FUNCTION AND SEQUENCE						
Are displays arranged in relation to one another according to their sequence of use or the functional relations of the components they represent?	X				2	
5.2.1.4.8 FREQUENCY OF USE						
Are displays that are frequently used grouped together and placed in an optimum visual zone?	X				2	
5.2.1.4.9 IMPORTANCE						
Are important or critical displays located in a privileged position in the optimum projected visual zone or otherwise highlighted?	X				2	
5.2.1.4.10 CONSISTENCY						
Are similar displays arranged consistently within the assembly or across similar assemblies?	X				2	
5.2.1.4.11 MAXIMUM VIEWING DISTANCE						
Is the viewing distance from the eye reference point of the seated operator to displays located close to their associated controls? (less than 635mm (25 in))	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.1.5 CODING						
5.2.1.5.1 OBJECTIVES						
Are coding techniques used to facilitate:						
a. discrimination of individual displays?	X				1	
b. identification of functionally related displays?	X				1	
c. indication of relationships between displays?			X		—	
d. identification of critical information within a display?	X				2	
5.2.1.5.2 TECHNIQUES						
Are displays coded by color, size, location, shape or flash coding, as applicable?	X				1	
5.2.1.5.3 STANDARDIZATION						
Is coding within the system uniform and established by agreement with the procuring activity?	X				1	
5.2.2.3 SIMPLE INDICATOR LAMPS						
5.2.2.3.1 USE						
Are simple indicator lamps used when design considerations preclude the use of legend lights?	X				1	3-D
5.2.2.3.2 SPACING						
Is the spacing between adjacent edges of simple round indicator lamps sufficient to permit unambiguous labeling, signal interpretation, and convenient bulb removal?	X				1	
5.2.2.3.3 CODING						
Are simple indicator lights coded in conformance with TABLE II, page, 33, 1472c?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.4 CATHODE RAY TUBE (CRT) DISPLAYS						
5.2.4.1 SIGNAL SIZE						
Is the image size of characters consistent with operator needs and requirements?	X				2	
5.2.4.2 VIEWING DISTANCE						
Is the viewing distance consistent with operator needs and requirements?	X				1	
5.2.4.3 SCREEN LUMINANCE						
Does the ambient illuminance contribute more than 25% of screen brightness through diffuse reflection and phosphor excitation?			X		—	
5.2.4.5 LUMINANCE RANGE						
Is the luminance range of surfaces immediately adjacent to scopes between 10% and 100% of screen background luminance?	X				1	
5.2.4.6 AMBIENT ILLUMINANCE						
Is the ambient illuminance in the CRT area appropriate for other visual functions (e.g., setting controls, reading instruments, etc) but not such that interference with the reading of the CRT is imperiled?	X				1	
5.2.4.7 REFLECTED GLARE						
Is reflected glare minimized by proper placement of the scope relative to the light source? (are hoods and shields used?)	X				1	
5.2.4.8 ADJACENT SURFACES						
Are surfaces adjacent to the scope of a dull matte finish?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.6 OTHER DISPLAYS						
5.2.6.1 GENERAL						
5.2.6.1.1 TYPES						
Where applicable, are direct-reading counters, printers, plotters flags, optical projections, LED, gas discharge, liquid crystal and electroluminescent displays used?	X				1	printer; elapsed-time counter on Wicat computer
5.2.6.1.2 APPLICATIONS						
Is the selection of the displays mentioned in 5.2.6.1.1 based on specific criteria as per TABLE III, 1472C, page 35?	X				1	
5.2.6.2 COUNTERS						
5.2.6.2.1 USE						
Are counters used for presenting quantitative data when a continuous trend indication is not required and when a quick, precise indication is needed?	X				1	elapsed system time meter on 2-D
5.2.6.2.2 MOUNTING						
Are counters mounted as close as possible to the panel surface so as to mimize parallax and shadows and maximize the viewing angle?	X				1	
5.2.6.3 PRINTERS						
5.2.6.3.1 USE						
Are printers used when a visual record of data is necessary or desirable?	X				3	
Do printers conform to TABLE III 1072C, page 35.	X				1	
5.2.6.3.2 VISIBILITY						
Is printed matter not hidden, masked, or obscured in a manner that does not impair direct reading?		X			1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.6.3.3 CONTRAST						
Is a minimum of 75% luminance contrast provided between the material and the background on which it is printed?	X				1	
5.2.6.3.4 ILLUMINATION						
Are printers provided with internal illumination if the printed matter is not legible in the planned operational ambient environment?			X		—	
5.2.6.3.5 TAKE-UP PROVISION						
Is a take-up device for printed material provided?		X			1	
5.2.6.3.6 ANNOTATION						
Where applicable, are printers mounted so that the printed matter (e.g., paper, metalized paper) may be easily annotated while still in the printer?	X				1	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA AUDIO DISPLAYS SECTION 5.3 (MIL-STD-1472C)

SYSTEM GRUMMAN SUBSYSTEM 2-D COMPONENT

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.3 AUDIO DISPLAYS						
5.3.1 GENERAL						
5.3.1.1 USE						
Are audio displays provided when:						
a. The information to be processed is short, simple, and transitory, requiring immediate or time-based responses?	X				2	But 3-D "Chirp needs to be shorter, of fixed duration
b. The common mode of visual display is restricted by overburdening; ambient light variability or limitation operator mobility; degradation of vision by vibration, high g-forces, hypoxia, or other environmental considerations; or anticipated operator inattention?			X		—	
c. The criticality of transmission response makes supplementary or redundant transmission desireable?			X		—	
d. It is desirable to warn, alert, or cue the operator to subsequent additional response?	X				2	"look" at touch-screen
e. Custom or usage has created anticipation of an audio display?			X		—	
f. Voice communication is necessary or desireable?			X		—	
5.3.1.2 SIGNAL TYPE						
When an audio presentation is required, is the signal presented in accordance with Table V, 1472c, page 52?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.3.1.3 FALSE ALARMS						
Does the audio display device and circuit preclude false alarms?	X				1	
5.3.1.5 CIRCUIT TEST						
Are audio displays equipped with circuit test devices or other means of operability tests?		X			1	
5.3.2 AUDIO WARNINGS						
5.3.2.1 WARNING SIGNALS						
Are audio signals provided, as necessary, to warn personnel of impending danger, to alert an operator to a critical change in system or equipment status, and to remind the operator of a critical action or actions that must be taken?	X				2	
5.3.2.4 RELATION TO VISUAL DISPLAYS						
When used in conjunction with visual displays; are audio warning devices supplementary or supportive?	X				1	
Does the audio signal alert and direct operator attention to the appropriate visual display?	X				2	look at touch-screen CRT
5.3.3 CHARACTERISTICS OF AUDIO WARNING SIGNALS						
5.3.3.1 FREQUENCY						
5.3.3.1.1 RANGE						
Is the range of the warning signals between 200 and 5000 hz. (preferably between 500 and 3000 hz.)?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.3.3.2 INTENSITY						
5.3.3.2.1 COMPATIBILITY WITH ACOUSTICAL ENVIRONMENT						
Is the intensity, duration and source location of audio alarms and signals compatible with the acoustical environment of the intended receiver as well as the requirements of other personel in the signal area?	X				1	
5.3.3.2.2 DISCOMFORT						
Is the intensity of audio warning signals low enough such that discomfort and/or "ringing" is not caused in the ears of listeners?		X			2	error tone, attention orientating

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA CONTROLS SECTION 5.4 (MIL-STD-1472C)

SYSTEM GRUMMAN SUBSYSTEM 3-D/2-D COMPONENT

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4 CONTROLS						
5.4.1 GENERAL CRITERIA						
5.4.1.1 SELECTION						
5.4.1.1.1 DISTRIBUTION OF WORK LOAD						
Are controls selected and distributed so that none of the operator's limbs are overburdened?	X				1	easy and simple to operate
5.4.1.1.5 STOPS						
Are stops provided at the beginning and end of the range of control position if the control is not required to be operated beyond a particular end position or specified limit?	X				1	
5.4.1.2. DIRECTION OF MOVEMENT						
5.4.1.2.1 CONSISTENCY OF MOVEMENT						
Is the direction of control movement consistent with the related movement of an associated display, equipment component, or vehicle?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4 CONTROLS 5.4.1.3 ARRANGEMENT AND GROUPING						
5.4.1.3.1 GROUPING						
Are all controls which function in sequential operation, or which operate together, grouped together along with their associated displays?	X				1	
5.4.1.3.2 SEQUENTIAL OPERATIONS						
Do controls which are involved in sequential operations follow a fixed pattern?	X				1	
5.4.1.3.3 LOCATION OF PRIMARY CONTROLS						
Do the most important and frequently used controls have a favorable position with respect to ease of use?	X				1	
5.4.1.3.4 CONSISTENCY						
Are functionally similar or identical primary controls arranged consistently from panel to panel throughout the system, equipment, etc.?			X		—	
5.4.1.3.7. SPACING						
Does spacing between controls comply with Table VII (page 65) in Mil-Std-1472c?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.1.4 CODING						
5.4.1.4.1 METHODS AND REQUIREMENTS						
Where coding of controls is used, is it consistent throughout the system?	X				1	
5.4.1.4.2 LOCATION CODING						
Are controls associated with similar functions in the same relative location?	X				1	
5.4.1.5 LABELING OF CONTROLS						
Does control labeling conform the criteria set forth in paragraph 5.5?	X				1	
5.4.1.8 PREVENTION OF ACCIDENTAL ACTIVATION						
5.4.1.8.1 LOCATION AND DESIGN						
Are controls designed and located so that they are not susceptible to accidental activation?	X				1	
5.4.2.1.2 KEY OPERATED SWITCHES						
5.4.2.1.1 USE						
Are key operated switches used to prevent unauthorized operation?	X				1	on 2-D console

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.2.1.2.2 DIMENSIONS, DISPLACEMENT AND RESISTANCE						
Do the dimensions, displacement, and resistance of key operated switches conform to Figure 5, 1472C?	X				1	
5.4.2.1.2.4 MARKING AND LABELING						
Does the keylock application include appropriate positional markings and labels?		X			1	
5.4.2.1.2.5 OTHER REQUIREMENTS						
Do keys have teeth on both edges?		X			1	
Is key lock oriented so that the key's vertical position is the off position?		-			1	
Can the key be removed only when the lock is in the off position?		X			1	Key can be removed when in "on" position
Is activation of the system accomplished by turning the key in a clockwise direction?		X			1	counterclockwise activates 2-D console equipment
5.4.2.1.3 DISCRETE THUMBWHEEL CONTROLS						
5.4.2.1.3.1 APPLICATION						
Are thumbwheel controls used where precise numberical inputs are required on the part the operator?	X				1	STE/ICE "TEST SELECT"

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.2.1.3.2 SHAPE						
Are positions around the circumference of discrete thumbwheel controls provided with a concave surface or separated by a high-friction area which is raised from the periphery of the thumb-wheel?			X		—	
Do thumbwheels not preclude viewing the digits within 30 degrees viewing angle to the left and right of a perpendicular to the thumbwheel digits?			X		—	
5.4.2.1.3.3 CODING						
Are thumbwheel controls coded by loction, labeling, and color?	X				1	STE/ICE TEST SELECT is labeled
If used as input devices, are OFF and ON positions color coded to permit a visual check that the digits have been reset to their normal positions?			X		—	
5.4.2.1.3.4 DIRECTION OF MOVEMENT						
Does moving the thumbwheel edge forward, or upward, or to the right increase the setting?	X				1	
5.4.2.1.3.5 NUMERALS						
5.4.2.1.3.5.1 EXTERNAL LUMINANCE						
Are digits bold, black numerals engraved on a light (or white) thumbwheel background?		X			1	white on black
Is the height-to-stroke width ratio approximately 10:1?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.2.1.3.6 VISIBILITY						
Does thumbwheel design permit viewing of inline digital readout from all operator positions?	X				1	
5.4.2.1.3.7 DIMENSIONS						
Do thumbwheel control dimensions conform to the criteria set forth in Figure 6, 1472, page 77?	X				1	
5.4.2.1.3.8 RESISTANCE						
Is control resistance elastic?	X				1	
Does resistance build up and then decrease as each detent is approached so that the control snaps into position without stopping between adjacent detents?	X				1	
5.4.2.1.3.9 SEPARATION						
Does separation between adjacent edges of thumbwheel controls conform to the criteria in Figure 6, 1472c and sufficient to preclude accidental activation of adjacent controls during normal setting?	X				1	
5.4.3 LINEAR CONTROLS						
5.4.3.1 DISCRETE LINEAR CONTROLS						
5.4.3.1.1 PUSH BUTTONS (FINGER OR HAND OPERATED)						
5.4.3.1.1.1 USE						
Are push button used when a control or an array of controls is needed for momentary contact or for activating a locking circuit, particularly in high-frequency-of-use situations?	X				1	start button 3-D console; test button on STE/ICE

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.1.2 SHAPE						
Are push button surfaces concave (indented) so as to fit the finger?		X			1	not critcal or necessary
Does the surface provide a high degree of frictional resistance to prevent slipping?		X			1	not critical or necessary
5.4.3.1.1.3 POSITIVE INDICATION						
Does control activation produce a positive indication of that activation (e.g., snap feel, audible click, or integral light)?	X				1	elastic resistance with stop
5.4.3.1.1.4 CHANNEL OR COVER GUARD						
Is a channel or cover guard used when it is imperative to prevent accidental activation of the controls?			X		—	
Do cover guards, in the open position, not interfere with operation of the protected device or adjacent controls?			X		—	
5.4.3.1.1.5 DIMENSIONS, RESISTANCE, DISPLACEMENT, AND SEPARATION						
Do push button dimensions, resistances, displacements, and separations confere to the criteria set forth in Figure 11, 1472c, page 88?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.4 TOGGLE SWITCH CONTROLS						
5.4.3.1.4.1 USE						
Are toggle switches used for functions which require two discrete positions or where space limitations are severe?	X				1	
5.4.3.1.4.2 ACCIDENTAL ACTIVATION						
When the prevention of accidental activation is of primary importance (i.e., critical, dangerous, or hazardous conditions would result) are channel guards, lift-to-unlock switches, or other equivalent prevention mechanisms provided?		X			—	
Is safety or lock wire not used?		X			—	
If a cover guard is used, does its location interfere with the operation of the protected device or adjacent controls?		X			—	
5.4.3.1.4.3 DIMENSIONS, RESISTANCE DISPLACEMENT, AND SEPARATION						
Do dimensions, resistances, displacements, and separations between adjacent edges of toggle switches conform to the criteria set forth in Figure 13, 1472c, page 93?	X				1	
Can toggle switches be stopped only at numerical positions?	X				1	
5.4.3.1.4.4 POSITIVE INDICATION						
Is an indication of control activation provided (e.g., snap feel, audible click, associated or integral light)?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.4.5 ORIENTATION						
Are toggle switches vertically oriented with OFF in the down position?	X				1	
Is horizontal orientation and actuation used only for compatibility with the controlled function or equipment location?			X		—	
5.4.3.1.6 ROCKER SWITCHES						
5.4.3.1.6.1 USE						
Are rocker switches used in lieu of toggle switches for functions which require two discrete positions?	X				1	on disc drive
Are rocker switches used where toggle switch handle protrusions might snag the operator's sleeve or phone cord, or where there is insufficient panel space for separate labeling of switch positions?		X			1	
5.4.3.1.6.2 ACCIDENTAL ACTIVATION						
Are channel guards or equivalent protective measures used when the prevention of accidental activation is of primary importance (e.g., critical, dangerous or hazardous conditions would result)?			X		—	
5.4.3.1.6.3 POSITIVE INDICATION						
Is an indication of control activation provided (e.g., snap feel, audible click, associated or integral light)?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.6.4 DIMENSIONS, RESISTANCE DISPLACEMENT, AND SEPARATION						
Do dimensions, resistances, displacements, and separations between centers of rocker switches conform to the criteria in Figure 15, 1472c, page 96?	X				1	
Does resistance gradually increase, and then drop when the switch snaps into position?	X				1	
Can the switch be stopped only at the required positions?	X				1	
5.4.3.1.6.6 ORIENTATION						
Where practicable, are rocker switches mounted vertically?	X				1	
Does activation of the upper wing turn the equipment or component on?	X				1	
Is horizonal orientation of rocker switches used only for compatibility with the controlled function or equipment location?			X		—	
5.4.3.1.6.7 COLOR AND ILLUMINATION						
Are alternate colors used to denote the ON and OFF positions of a rocker switch?		X			1	not critical or necessary
Is alternate illumination of either the ON or OFF positions used to facilitate positive recognition of current switch position?		X			1	not critical

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA LABELING SECTION 5.5 (MIL-STD-1472C)

SYSTEM GRUMMAN SUBSYSTEM _____ COMPONENT _____

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.5 LABELING						
5.5.1 GENERAL						
5.5.1.1 APPLICATION						
Are labels, legends, placards, signs, or markings provided where personnel must identify, interpret, or follow procedures or avoid hazards?	X				2	
5.5.1.2 LABEL CHARACTERISTICS						
Are labels:						
accurate in their information?	X				2	
consistent with time available for recognition or other responses?	X				1	
readable at reasonable distance?	X				1	
properly illuminated and colored?			X		—	
consistent with criticality of function labeled?	X				1	
consistent within and between system components and subsystems?	X				1	
5.5.1.3 PROTOTYPE AND PRODUCTION EQUIPMENT LABELS						
Are labels on prototype easily and simply affixed so that they can be altered, and removed if design changes occur?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.5.2 ORIENTATION AND LOCATION						
5.5.2.1 ORIENTATION						
Are labels and information on them oriented horizonally so that they can be read quickly and easily form left to right?	X				2	
5.5.2.2 LOCATION						
Are labels placed on or very near the items which they identify?	X				2	
Are labels placed so no other information is hidden?	X				1	
Are labels placed so controls do not obscure label information?		X			1	start button label obscured by start button
5.5.2.3 STANDARDIZATION						
Are labels located in a consistent manner thoughout the equipment and system?	X				2	
5.5.3 CONTENTS						
5.5.3.1 EQUIPMENT FUNCTIONS						
Do labels primarily describe the functions of equipment items?	X				2	
5.5.3.2 ABBREVIATIONS						
Are abbreviations used on labels?	X				1	
If abbreviations are used, do they conform to military standards?	X				1	
5.5.3.3 IRRELEVANT INFORMATION						
Does only relevant information appear on labels or placards?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.5.4 QUALITIES						
5.5.4.1 BREVITY						
Are labels consise as possible without sacrificing intended meaning or information?	X				2	
Are labels or placards unambiguous?	X				2	
5.5.4.2 FAMILIARITY						
Do words on labels or placards use familiar words or language?	X				2	
Are common terms used which will be understood by those who will operate the equipment?	X				2	
5.5.4.3 VISIBILITY AND LEGIBILITY						
Can labels and placards be read easily and accurately at operational distances?	X				2	
5.5.4.4 ACCESS						
Are labels placed so that they are not obscured or covered by other equipment or assemblies?		X			1	see 5.2.2.2
5.5.4.5 LABEL LIFE						
Are labels clear and distinct?		X			1	stenciling has worn off on some labels
Do they have high contrast?	X				1	
Are they resistant to grease, grime, dirt, etc.?		X			1	some stenciled labels are not
5.5.4.6 LABEL BACKGROUND						
Does label color contrast with the equipment background specified in 5.7.9?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.5.5.4 CAPITAL VS LOWER CASE						
5.5.5.4.1 LABELS						
Are labels printed in all capitals?	X				1	
5.5.6 EQUIPMENT LABELING						
5.5.6.1 UNITS, ASSEMBLIES, SUB-ASSEMBLIES AND PARTS						
5.5.6.1.1 GENERAL REQUIREMENTS						
Are units, assemblies, sub-assemblies and parts labeled with a clearly visible, legible, and meaningful name, number, code, mark or symbol, as applicable?	X				1	
5.5.6.1.2 LOCATION						
Are gross identifying labels on a unit, assembly or major subassembly located:						
so that they are not obscured by adjacent items?	X				1	
on the flattest, most uncluttered surface available?	X				1	
in a way so as to minimize wear or obscurement by grease, grime, etc.?	X				1	
in a way to preclude accidental removal, obstruction, or damage?	X				1	
5.5.6.2 CONTROLS AND DISPLAYS						
5.5.6.2.1 GENERAL REQUIREMENTS						
Are controls and displays appropriately and clearly labeled with enough information for proper identification, utilization, actuation, or manipulation of the element?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.5.6.2.2 SIMPLICITY						
Do control and display labels convey verbal meaning in a direct and unambiguous manner?	X				2	
Do they use simple words and phrases?	X				1	
5.5.6.2.3 FUNCTIONAL LABELING						
Are controls and displays labeled according to their function, according to the following criteria:						
are dissimilar names used for different controls and displays?	X				2	
are instruments labeled in terms of what is being measured or controlled, and in terms of the purpose and use by the operator?	X				2	
does control labeling indicate functional result of a control movement?	X				2	generally
when applicable, are appropriate labels used to indicate the functional relationships between controls and displays?			X		—	
5.5.6.2.4 LOCATION						
When applicable, do control and display labels meet the following criteria:						
is ease of control operation given priority over visibility of control position labels?	X				1	
are labels placed over the controls and displays they describe?		X			1	"Master Switch" labeled below; also "Instrument Switch"
are labels used to identify functionally grouped controls and displays?	X				1	
is label location uniform throughout the system and subsystems uniform?		X			1	" " "

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA WORKSPACE DESIGN REQUIREMENTS SECTION 5.7 (MIL-STD-1472C)

SYSTEM GRUMMAN SUBSYSTEM _____ COMPONENT _____

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.7 WORKSPACE DESIGN REQUIREMENTS						
5.7.1 GENERAL						
5.7.1.1 KICK SPACE						
Are cabinets, consoles, and work surfaces that require an operator to stand or sit close to their front surface provided with a kick space at the base at least 100 mm (4 in.) deep and 100 mm (4 in.) high?	X				1	instructor station
5.7.2 STANDING OPERATIONS						
5.7.2.1 WORK SURFACE						
Are work surfaces which must support job instruction manuals, worksheets, etc. 915 +/-15 mm (36 +/-.6 in.) above the floor?	X				1	3-D MODULE
5.7.2.2 DISPLAY PLACEMENT, NORMAL						
Are visual displays mounted on vertical panels and used in normal equipment operations placed between 1.040 m (41 in.) and 1.780 m (70 in.) above the standing surface?	X				1	
5.7.2.3 DISPLAY PLACEMENT, SPECIAL						
Are displays requiring precise and frequent reading placed between 1.270 m (50 in.) and 1.650 m (65 in.) above the standing surface?	X				1	
5.7.2.4 CONTROL PLACEMENT, NORMAL						
Are controls mounted on vertical surfaces and used in normal equipment operations located between 860 mm and 1.780 m (34 and 70 in.) above the standing surface?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.7.2.5 CONTROL PLACEMENT, SPECIAL						
Are controls requiring precise or frequent operation and emergency controls mounted between 860mm and 1.350 m (34 and 53 in.) above the standing surface and no farther than 530 mm (21 in.) laterally from the centerline?	X				1	
5.7.3 SEATED OPERATIONS						
5.7.3.1 WORK SURFACE WIDTH						
Has a lateral workspace of at least 760 mm (30 in.) wide and 400 mm (16 in.) deep been provided?	X				1	
5.7.3.2 WORK SURFACE HEIGHT						
Are desk tops and writing tables between 740 and 790 mm (29 to 31 in.) above the floor?	X				1	instructor station
5.7.3.3 WRITING SURFACES						
Where a writing surface is required on equipment consoles, is that surface at least 400 mm (16 in.) deep and 610 mm (24 in.) wide?	X				1	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA MAINTAINABILITY SECTION 5.9 (MIL-STD-1472C)

SYSTEM GRUMMAN SUBSYSTEM _____ COMPONENT _____

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9 DESIGN FOR MAINTAINABILITY						
5.9.1 GENERAL						
5.9.1.1 STANDARDIZATION						
Is equipment designed to incorporate standard parts to the maximum extent possible?	X				2	
5.9.1.2 SPECIAL TOOLS						
Are special tools required for operation adjustment securely mounted within the equipment in a readily accessible location?			X		—	
5.9.1.3 MODULAR REPLACEMENT						
Is equipment designed and constructed for replacement of modular packages?	X				1	generally true, e.g., videodisc player, CRT, printer, etc.
Is rapid and easy removal and replacement of modular packages provided wherever possible?	X				1	
5.9.1.4 GROUPING OF FUNCTIONS						
Is the number of inputs to and outputs from each unit kept to a minimum by grouping functions so as to minimize criss-crossing of signals?	X				1	
5.9.1.5 SEPARATE ADJUSTABILITY						
Are functions so unitized that it will be possible to check and adjust each item separately, except where this would be inconsistent with established maintenance concepts?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.1.6 MALFUNCTION IDENTIFICATION						
Does equipment design facilitate rapid and positive fault detection and isolation of defective items to permit their prompt removal and replacement?				X	—	
5.9.1.7 ASSEMBLY AND DISASSEMBLY						
Does equipment design facilitate assembly and disassembly?	X				2	generally true for major system components
5.9.1.9 FOOLPROOF DESIGN						
Have provisions been made to preclude improper mounting and installation of parts?				X	—	
Have the following provisions been accomplished:						
a. Physical measures to preclude interchange of units or components of a same or similar form that are not in fact functionally interchangeable?				X	—	
b. Physical measures to preclude improper mounting of units or components?				X	—	
c. Measure (e.g., coding) to facilitate identification and interchange of interchangeable units or components?				X	—	
d. Measures (e.g., alignment pins) to facilitate proper mounting of units and components?				X	—	
e. Measures to insure that identification, orientation, and alignment provisions include cables and connectors?				X	—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.2 MOUNTING OF ITEMS WITHIN UNITS						
5.9.2.1 USE OF TWO-DIMENSIONAL SURFACE						
Are parts mounted in an orderly array on a "two-dimensional" surface rather than "stacked" one on another (i.e., a lower layer should not support an upper layer)?				X	—	
5.9.2.2 SIMILARITY						
Are items of the same or similar form, but different functional properties, mounted with a standard orientation throughout the unit?				X	—	
Are these items readily identifiable and distinguishable, and not physically interchangeable?				X	—	
5.9.2.3 DELICATE ITEMS						
Are delicate items located or guarded, so that they will not be susceptible to damage while the unit is being handled or maintained?	X				2	generally true, however, some cable connectors are vulnerable to damage on rear of 2-D console
5.9.3 ADJUSTMENT CONTROLS						
5.9.3.1 GENERAL						
Are controls required for mainte maintenance purposes in compliance with basic control design requirements in 5.4 and labeling requirements in 5.5?			X		—	
5.9.3.1.1 CALIBRATION ADJUSTMENTS						
Are knobs used in preference to screwdriver adjustments whenever frequent adjustment must be made?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.3.2 SCREWDRIVER ADJUSTMENTS						
If screwdriver adjustments must be made without the aid of vision, have mechanical guides for the screwdriver shaft been provided or the screws mounted so that the screwdriver will not move out of position?				X	—	
5.9.3.3 REFERENCE SCALE FOR ADJUSTMENT CONTROLS						
Has a reference scale been provided to offer appropriate feedback for all adjustment controls?				X	—	
5.9.3.4 CONTROL LIMITS						
Have calibration or adjustment controls which are intended to have a limited degree of motion been provided with adequate mechanical stops to prevent damage?				X	—	
5.9.3.5 SENSITIVE ADJUSTMENTS						
Are sensitive adjustment points located or guarded so that adjustmens will not be disturbed inadvertently?				X	—	
5.9.3.6 HAZARDOUS LOCATIONS						
Are internal controls located away from dangerous voltages, rotating machinery, or any other hazards?				X	—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.4 ACCESSIBILITY						
5.9.4.1 STRUCTURAL MEMBERS						
Are structural members of units or chassis parts located so as not to prevent access to or removal of items?				X	—	
Are replaceable items mounted in a manner which will make them easy to remove?				X	—	
Where accessibility depends upon removal of panels, cases, and covers, have measures been taken to insure that such items are not blocked by structural members or other items?	X				1	
5.9.4.2 LARGE ITEMS						
Are large items which are difficult to remove mounted so that they will allow convenient access to other items?				X	—	
5.9.4.3 USE OF TOOLS AND TEST EQUIPMENT						
Are check points, adjustment points, test points, cables, connectors, and labels accessible and visible during maintenance?				X	—	
Has sufficient space been provided for the use of test equipment and other required tools without difficulty or hazard?				X	—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.4.4 REAR ACCESS						
Is sliding, rotating or hinged equipment to which rear access is required free to open or rotate fully and remain in an open position without being supported by hand?				X	—	
Has rear access also been provided to plug connectors except where precluded by any other operational requirements?	X				1	
5.9.4.5 RELATIVE ACCESSIBILITY						
Have items most critical to system operation and which require rapid maintenance been made most accessible?	X				2	
5.9.4.6 HIGH-FAILURE-RATE ITEMS						
Are high-failure-rate items accessible for replacement without moving non-failed parts?				X	—	
Are these replacement items removable with common hand tools and simple handling equipment?				X	—	
5.9.4.7 SKILLS						
Does access to items maintained by one technician allow critical equipment maintained by another technician to remain in place?				X	—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.9 ACCESS OPENINGS AND COVERS						
5.9.9.1 APPLICATION						
Has an access been provided whenever frequent maintenance operations require removing a case or covering, opening a fitting, or dismantling an item of equipment?			X		—	
5.9.9.2 SELF-SUPPORTING COVERS						
Are access covers that are not completely removable, self-supporting?				X	—	
Are accesses (and covers) devoid of sharp edges to preclude hand injury and clothing damage?				X	—	
5.9.9.3 LABELING						
Are accesses labeled with nomenclature for items visible or accessible through it?				X	—	
Are accesses labeled with warning signs, advising of any hazards existing beyond the access and stating necessary precaution?				X	—	
Are warning notices clear, direct, and attention-getting?				X	—	
5.9.13 CONDUCTORS						
5.9.13.1 CODING						
Are cables containing individually insulated conductors with a common sheath, coded?	X				1	
5.9.13.2 CABLE CLAMPS						
Are long conductors, bundles, or cables, internal to equipment, secured to the equipment chassis by means of clamps unless contained in wiring ducts or cable retractors?		X			1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.13.3 LENGTH						
Are cables long enough so that each functioning unit can be checked in a convenient place?	X				1	
5.9.13.4 LOCATION OF TEST CABLES						
If test cables must terminate on control and display panels, are test receptacles located so that the test cables will not interfere with controls and displays?				X	—	
5.9.13.5 ACCESS						
Are cables routed so as to be readily accessible for insepction and repair?	X				1	
5.9.13.6 SUSCEPTABILITY TO ABUSE						
Are cables routed or protected in such a way that they may not be pinched by doors, lids, etc., walked on, used for hand holds, or bent or twisted sharply or repeatedly?	X				2	
5.9.13.7 CABLE PROTECTION						
If cables and wires are routed through holes in metal partitions, are the conductors protected from mechanical damage or wear by grommets or equivalent means?			X		—	
5.9.13.8 IDENTIFICATION						
Are cables labeled to indicate the equipment to which they belong and the connectors with which they mate?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.14 CONNECTORS						
5.9.14.1 USE OF QUICK DISCONNECT PLUGS						
Are plugs which require no more than one turn, or other quick-disconnect plugs, used whenever possible?	X				1	
5.9.14.2 KEYING						
Are plugs designed so that it is impossible to insert the wrong plug into a receptacle?	X				1	
5.9.14.3 IDENTIFICATION						
Does marking of electrical connectors confora to REQUIREMENT 67 of MIL-STD-454?				X	—	
Are electrical plugs and receptacles also identified by color, shape or equivalent means?		X			1	
5.9.14.4 ALIGNMENT						
Are plugs or receptacles provided with aligning pins or equivalent devices to aid in alignment and to preclude inserting in other than the desired position?	X				1	
5.9.14.5 ALIGNMENT PINS						
Do alignment pins extend beyond the plug's electrical pins to insure that alignment is obtained before electrical pins engage?	X				1	
5.9.14.6 ORIENTATION						
Are plugs and receptacles arranged so that the aligning pins or equivalent devices are oriented in the same relative position?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.14.7 CODING						
Are plugs and receptacles provided with durable strips, arrows, or other indications to show the positions of aligning pins or equivalent devices for proper insertion?			X		—	
5.9.17 FAILURE INDICATIONS AND FUSE REQUIREMENTS						
5.9.17.1 INDICATION OF EQUIPMENT FAILURE						
5.9.17.1.1 POWER FAILURE						
Is an indication provided to reveal when power failure occurs?		X			1	
5.9.17.1.3 CRITICAL MALFUNCTIONS						
If equipment is not regularly monitored, and if the equipment fails, is an auditory alarm provided to indicate critical malfunctions?		X			1	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA HAZARDS & SAFETY SECTION 5.13 (MIL-STD-1472C)

SYSTEM GRUMMAN SUBSYSTEM _____ COMPONENT _____

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.13 HAZARDS AND SAFETY 5.13.1 GENERAL						
Are safety factors given a major consideration in the overall design?	X				2	
5.13.2 SAFETY LABELS AND PLACARDS						
5.13.2.1 WARNING PLACARDS						
Are conspicuous placards mounted adjacent to any equipment which represents a hazard to personnel?			X		—	
5.13.2.6 ELECTRICAL LABELS						
Are all receptacles marked with their voltage, phase, and frequency characteristics, as appropriate?		X			1	desirable, but not essential
5.13.5 GENERAL EQUIPMENT-RELATED HAZARDS						
5.13.5.2 ACCESS						
Are units located and mounted so that access to them can be achieved without danger to personnel from electrical charge, heat, moving parts, chemical contamination, radiation, or other hazards?	X				1	
5.13.5.4 EDGE ROUNDING						
Where applicable, are exposed edges and corners rounded to a minimum of .75 mm (.03 in) radius?		X			1	Videodisc drawer on 2-D console has sharp corners which can inflict injury to legs of users if drawer is left open during system operation

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.13.7. ELECTRICAL, MECHANICAL, FLUID TOXIC AND RADIATION HAZARDS						
5.13.7.1 ELECTRICAL HAZARDS						
5.13.7.1.1 INSULATION OF TOOLS						
Are tools and test leads to be used near high voltages adequately insulated?			X		—	
5.13.7.1.2 PLUGS AND RECEPTACLES						
Are plugs and receptacles designed so that a plug of one voltage rating cannot be inserted into a receptacle of another rating?	X				1	
5.13.7.1.4 HIGH VOLTAGES						
Are guards, grounding, interlocks, and warning placards provided so as to minimize the possibility of exposing personnel to dangerous voltages?	X				1	
5.13.7.1.7 ELECTRONIC EQUIPMENT						
Is electronic equipment designed in accordance with Requirement 1 of Mil-std-454?				X	—	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA USER-COMPUTER INTERFACE SECTION 5.15 (MIL-STD-1472C)

SYSTEM GRUMMAN SUBSYSTEM 2-D COMPONENT

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15 USER-COMPUTER INTERFACE 5.15.1 GENERAL						
Do computer programs and computer interfaces provide a functional interface between the system for which they were designed and users (operators/ maintainers) of the system?	X				4	
5.15.2 DATA ENTRY						
5.15.2.1 GENERAL						
5.15.2.1.1 USER PACING-MANUAL						
Is data entry paced by the user, depending on the user's application, criticality of operation and attention span, rather than by the system?	X				2	
5.15.2.1.2 POSITIVE FEEDBACK						
Does the system provide positive feedback to the user about the acceptance or rejection of a data entry?	X				2	In most cases, refuses to display typed input, e.g., in authoring program
5.15.2.1.3 PROCESSING DELAY						
Where system overload or other system conditions will result in a processing delay, does the sytem acknowledge the data entry and provide an indication of the delay to the user?	X				1	While generally true, there are times when it would be desirable for system to inform the instructor/student as to what is being done; e.g., "searching for lesson segment ... please wait."
5.15.2.1.4 EXPLICIT ACTION						
Does data entry require an explicit completion actions, such as depression of an ENTRY or RETURN key?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.2.1.5 VALIDATION						
Are data entries validated by the sytem for correct format, legal value, or range of values?	X				2	
5.15.2.1.6 SOFTWARE-AVAILABLE DATA						
Is the user not required to enter data already available to the software?	X				1	
5.15.2.1.7 INPUT UNITS						
Are data entered in units which are familiar to the user?	X				2	generally yes except for 3-D codes
5.15.2.1.8 CURSORS						
5.15.2.1.8.1 CONTROL						
Does the system employ a cursor which provides cursor control capability consistent with user speed and accuracy requirements?	X				1	
5.15.2.1.8.2 DISPLAY						
Do movable cursors within a display have distinctive visual attributes which do not obscure other displayed entities?	X				1	
5.15.2.1.8.3 HOME POSITION						
Is the home position of the cursor consistent across similar types of displays?	X				1	
5.15.2.1.8.10 ABBREVIATIONS, MNEMONICS, AND CODES						
When abbreviations, mnemonics, or codes are used to shorten data entry, are they distinctive and have a relationship or association to normal language or specific job-related terminology?		X			1	3-D codes are frequently unclear

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.2.2 KEYBOARD						
5.15.2.2.1 USE						
Is a keyboard used to enter alphabetic, numeric and other special characters into the system?	X				1	
5.15.2.2.2 CONFIGURATION						
Does the keyboard conform to MIL-STD-1280, unless otherwise specified or approved by the procuring authority?				X	—	
5.15.2.2.3 TIMELY DISPLAY						
Are keyed inputs, except security items such as passwords, echoed on the display within 0.1 sec?	X				1	
5.15.2.2.4 LENGTH						
Is the length of individual data items reasonable?	X				1	
5.15.2.2.5 JUSTIFICATION						
Is the user not required to justify tabular data?	X				1	
5.15.2.2.6 NUMERIC KEYBOARDS						
Is a a numeric keyboard provided?	X				1	
5.15.2.2.7 MINIMIZATION OF KEYING						
Is the amount of keying necessary by the user minimized?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.2.3 FIXED FUNCTION (DEDICATED) KEYS						
5.15.2.3.1 USE						
Are fixed function keys used for time-critical, error-critical or frequently used control inputs?		X			1	not necessary
5.15.2.3.2 STANDARDIZATION						
Are fixed function keys common throughout the system?			X		—	
5.15.2.3.3 FUNCTIONAL CONSISTENCY						
Are fixed-function keys always assigned to perform the same function all the time?			X		—	
5.15.2.3.4 AVAILABILITY						
Are fixed function keys selected to control functions that are continuously available?			X		—	
Are lockouts of fixed function keys minimized?			X		—	
5.15.2.3.5 NON-ACTIVE KEYS						
Are non-active fixed function keys blanked out on the keyboard?			X		—	
5.15.2.3.6 GROUPING						
Are fixed function keys logically grouped and placed in a distinctive location on the keyboard?			X		—	
5.15.2.3.7 ACTIVATION						
Do fixed function keys require only a single keystroke?			X		—	
5.15.2.3.8 FEEDBACK						
Does activation of a fixed function key give the user system acknowledgement?			X		—	
5.15.2.3.9 FUNCTION LABELS						
Are key assignments displayed at all time, preferably through direct marking?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.2.4 VARIABLE FUNCTION KEYS						
5.15.2.4.1 USE						
Are variable function keys used for programmable menu selection and entry of control functions?			X		—	
5.15.2.4.2 STATUS DISPLAY						
When the effect of a function key changes, is the status of the key displayed to the user?			X		—	
5.15.2.4.3 REPROGRAMMABLE OR INACTIVE DEFAULT FUNCTIONS						
Is the user warned visually when a standard function is not currently available?			X		—	
5.15.2.4.4 RELABELING						
Has provision been made for easily relabeling variable function keys?			X		—	
5.15.2.4.5 SHIFTED CHARACTERS						
Are variable function keys not activated by depressing the shift key along with a character key?			X		—	
5.15.3 DATA DISPLAY						
5.15.3.1 DISPLAY FORMAT						
5.15.3.1.1 CONSISTENCY						
Are display formats consistent within a system?	X				1	
a. When appropriate for users, is the same format used for input and output?			X		—	
b. Do data entry formats match the source document formats?			X		—	
c. Are essential data, text, and formats under computer, not user control?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.1.2 CRITICALITY						
Are data that are essential the only kinds of data that are displayed to the user?	X				2	generally, yes
5.15.3.1.3 READILY USABLE FORM						
Are data displayed to the user in a readily usable and readable form?	X				2	
5.15.3.1.4 ORDER AND SEQUENCES						
When data fields have a n naturally occurring order (e.g., chronological), is the order reflected in the format organization of the fields?			X		—	
5.15.3.1.5 DATA SEPARATION						
Is separation of groups of information accomplished by blanks, spacing, lines, color coding, or or other means consistent with the application?	X				1	
5.15.3.1.6 RECURRING DATA FIELDS						
Do recurring data fields within system have consistent names and have consistent relative position within displays?	X				1	
5.15.3.1.7 EXTENDED ALPHANUMERICS						
When five or more alphanumerics without natural organization are displayed, are they grouped in blocks of three to five characters within each group separated by a minimum of one blank space or other separating character?			X		—	
5.15.3.1.8 COMPARATIVE DATA FIELDS						
With data fields that are to be compared on a character-by-character basis, are characters positioned one above another?			X		—	
5.15.3.1.9 LABELS AND TITLES						
Is each display labeled with a title or label that is unique within the system?	X				1	
Are fields and column headings labeled?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.1.10 DATA GROUP LABELS						
Do individual data groups or messages contain a descriptive title, phrase, word or similiar device to designate the content of the group or message?	X				1	
. Are labels:						
a. located in a consistent fashion adjacent to the data group or message they describe?	X				1	
b. highlighted or otherwise accentuated to facilitate operator scanning and recognition?			X		—	
c. unique and meaningful to distinguish them from data, error messages, or other alpha-numerics?	X				1	
d. displayed in upper case only? (text may be displayed in upper and lower case)		X			1	
e. reflective of the question or decision being posed to the user when presenting a list of options?	X				1	
5.15.3.1.11 SCROLLING						
Are items which are continued on the next page, numbered relative to the last item on the previous page?		X			1	
5.15.3.1.12 PAGE NUMBERING						
Is each page of a multiple page display labeled to identify the currently displayed page and total number of pages?			X		—	
5.15.3.1.13 FRAME IDENTIFICATION						
Does every display frame have a unique identification to provide a reference for use in requesting the display of that frame?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.2 DISPLAY CONTENT						
5.15.3.2.1 STANDARDIZATION						
Is the content of displays within the system presented in a consistent, standardized manner?	X				2	
5.15.3.2.2 INFORMATION DENSITY						
Is information density held to a minimum in displays used for critical task sequences?	X				2	
5.15.3.2.3 ABBREVIATIONS AND ACRONYMS						
Is information displayed in plain concise text wherever possible?	X				2	
Do abbreviations and acronyms conform to MIL-STD-12, MIL-STD-411, or MIL-STD-783?				X	—	
Are abbreviations distinctive to avoid confusion?	X				2	
Do words have only one distinctive abbreviation?	X				2	
Is punctuation not used in abbreviations?	X				1	
Have defintions of all abbreviations, mnemonics and codes been provided at the user's request?		X			2	
5.15.3.3 DISPLAY CODING						
5.15.3.3.1 USE						
Is coding employed to differentiate between items of information and to call the user's attention to changes in the state of the system?	X				2	
Is coding used for critical information, unusual values, changed items, items to be changed, high priority messages, special areas of the display, errors in entry, criticality of command entry, and targets.	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
Does coding not interfere with legibility or transmission time?	X				2	
5.15.3.3.2 FLASH						
Is flash coding used to call the user's attention to mission critical events only?			X		—	
Are not more than 2 flash rates used?			X		—	
Where one rate is used, is the rate between 3 and 5 flashes per second?			X		—	
Where two rates are used, is the second rate less than 2 per second?			X		—	
5.15.3.3.3 BRIGHTNESS						
Is brightness intensity coding used only to differentiate between an item of informion and adjacent information?			X		—	
Are not more than three levels of brightness used?			X		—	
Is each brightness level separated from the nearest by at least a 2:1 ratio?			X		—	
5.15.3.3.4 PATTERN						
Is pattern and location coding used to reduce user search time by restricting the area to be searched to prescribed segments?			X		—	
5.15.3.3.5 UNDERLINING						
Is underlining used to indicate unusual values, errors in entry, changed items or items to be changed?			X		—	
5.15.3.3.6 SYMBOL						
Is symbol coding used to enhance information assimilation from data displays?		X			1	
Are symbols analogs of the event or system element they represent or in general use and well-known to the user?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
Where size differences between symbols is employed, are the major dimensions of the larger at least 150% of the major dimension of the smaller with a maximum of three size levels permitted?			X		—	
5.15.3.3.7 COLOR						
Is color coding used to differentiate between classes of information in complex, dense, or critical displays?			X		—	
Are colors used not in conflict with the color associations specified in Table II?			X		—	
5.15.3.5 TABULAR DATA						
5.15.3.5.1 USE						
Are tabular data displays used to present row-column data?	X				1	
5.15.3.5.2 STANDARD FORMATS						
Is the location of recurring data similar among all tabular data displayed and common throughout the system?	X				1	
5.15.3.5.3 ARRANGEMENT						
Is tabular data displayed in a left-to-right, top-to-bottom array?	X				1	
Is alphanumeric data left-justified?			X		—	
Is numeric data right-justified with decimal points, if any, aligned vertically?			X		—	
5.15.3.5.4 TITLES						
When tabular data are divided into classifications, are classification titles displayed and subclassifications identified?	X				1	
If tabular data extend over more than one page vertically, are columns titled identically on each page?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.5.5 HORIZONTAL EXTENSION						
Do tabular displays remain on the one page & not extend over more than one page horizontally?	X				1	
5.15.3.5.6 LISTS						
Are items in lists arranged in a recognizable order, such as chronological, alphabetical, sequential, functional, or importance?	X				2	
5.15.3.5.6.1 LIST LINES						
Is each item in a list on a new line?	X				1	
5.15.3.5.6.2 VERTICAL EXTENSION						
Where lists extend over more than one display page, is the last line of one page the first line of the succeeding page?			X		—	
5.15.3.5.7 NUMERIC PUNCTUATION						
Are long numeric fields punctuated with spaces, commas, or slashes?			X		—	
Are conventional punctuation schemes used?			X		—	
5.15.3.5.8 ALPHANUMERIC GROUPING						
Are strings of alphanumerics grouped into sets of three to five characters or grouped at natural breaks?			X		—	
When a code consists of both letters and digits, are common character types grouped by common character type for ease of location?			X		—	
5.15.3.7 TEXTUAL DATA DISPLAYS						
5.15.3.7.1 USE						
Is information, such as abstracts or reports, presented in text format?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.7.2 FORMATS						
Do textual data formats conform to the practices established for the particular type of textual data displayed? (see MIL-STD-490)			X		—	
5.15.3.7.3 PARAGRAPH SEPARATION						
Are text paragraphs separated by a least one blank line?			X		—	
Are paragraphs numbered?			X		—	
5.15.3.7.4 BREVITY						
Are short, simple sentences used?			X		—	
5.15.3.7.5 CASE						
Is text displayed in both upper/lower case?	X				1	
5.15.3.7.6 ABBREVIATIONS						
Is information displayed in plain concise text where possible?	X				2	yes, except for inclusion of mnemonic codes from time to time
Are abbreviations distinctive to avoid confusion?	X				2	
Do words have only one distinctive abbreviation?	X				2	
Is punctuation not used in abbreviations?	X				1	
Have definitions of all abbreviations, mnemonics and codes been provided?	X				2	yes, but more explicit definition and description would be desirable
5.15.3.8 TEXT/PROGRAM EDITING						
5.15.3.8.1 BUFFER						
When inserting characters, words, or phrases (e.g., editing) are items to be inserted collected in a buffer area and displayed in the prescribed insert area of the screen for subsequent insertion by the user's command?	X				1	
5.15.3.8.2 PRESENTATION MODE						
Is display mode used for text editing?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.8.3 DISPLAY WINDOW						
Do ROLL and SCROLL commands refer to the display window, not the text/data, that is, does the display window appear to the user to be an aperture moving over stationary text?	X				1	
5.15.3.8.4.1 EDITING COMMANDS						
Are special text-editing commands based on sentences, paragraphs, or higher-order segments?			X		—	
5.15.3.8.4.2 PROGRAM EDIT COMMANDS						
In program editing, are special commands based on lines or subprograms?	X				1	
Do program lines reflect a numbering scheme for ease of editing and error correction?	X				1	
Is line-by-line syntax checking under user control?	X				1	
5.15.3.8.4.3 TAB CONTROLS						
Are cursor tab controls or other provision for establishing and moving readily from field to field provided?	X				1	
5.15.3.9. AUDIO DISPLAYS						
5.15.3.9.1 USES						
Are audio displays (signals) used as part of the user-computer interface?	X				2	however, they would also be a welcome addition in places, e.g., to signal entry error, etc.
Are audio displays used:						
a. when the common mode of visual display is restricted or overburdened, or when user mobility needs demand a cue, alert or warning?	X				2	"look" at CRT screen
b. when the user should be provided feedback after control actuation, data entry, or completion of timing cycles and sequences?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.9.3 SUPPORTIVE FUNCTION						
Are audio signals used to supplement visual displays to do such things as alert and direct the user's attention to appropriate visual display information?	X				2	
5.15.3.9.4 SIGNAL CHARACTERISTICS						
Is the intensity, duration, and source location of the audio signal compatible with the acoustical environment of the intended receiver as well as the requirements of other personnel in the signal area?	X				1	
Are such signals intermittent, allowing the user sufficient time to respond?	X				1	
5.15.4 INTERACTIVE CONTROL						
5.15.4.1 GENERAL						
Are system response times consistent with operational requirements?	X				2	generally, however, CRT is slow occasionally
5.15.4.1.1 SIMPLICITY						
Are control/display relationships straightforward and explicit?	X				2	
Are control actions simple and direct?	X				2	
5.15.4.1.2 ACCIDENTAL ACTUATION						
Have provisions been made to prevent accidental actuation of potentially destructive control actions, including the possibility of accidental erasure or memory dump?	X				2	
5.15.4.1.3 COMPATIBILITY WITH USER SKILL						
Are controls compatible with the lowest anticipated user skill levels?	X				2	typing/touch screen mainly

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.4.1.4 AVAILABILITY OF INFORMATION						
Is the information necessary to select or enter a specific control action available to the user when selection of that control action is appropriate?	X				2	generally
5.15.4.1.5 CONCURRENT DISPLAY						
Do control actions to be selected from a discrete set of alternatives have those alternatives displayed prior to the time of selection?	X				1	relevant to authoring program
5.15.4.1.6 HIERARCHICAL PROCESS						
If hierarchical levels are used to control a process or sequence, is the number of levels minimized?	X				1	
5.15.4.1.7 USER MEMORIZATION						
Is the requirement to learn mnemonics, codes, special or long seqences, or special instructions minimized?	X				2	to some extent, particularly with 3-D codes/mneumonics with instructor authoring program
5.15.4.1.8 DIALOGUE TYPE						
Is the dialogue for interactive control compatible with user characteristics and task requirements?	X				2	
5.15.4.1.9 NUMBER SYSTEM						
Is numeric data displayed or required for control input, in decimal, rather than binary, octal hexadecimal or other number systems?	X				2	
5.15.4.1.10 DATA MANIPULATION						
Can the user manipulate the data without concern for internal storage and retrieval mechanism within the system?	X				2	
5.15.4.1.11 COMPUTER PROCESSING CONSTRAINTS						
Is the sequence of transaction selection generally dictated by the user's choices and not by internal computer processing constraints?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.4.1.12 FEEDBACK FOR CORRECT INPUT						
Does the system acknowledge the user only in those cases where the more conventional mechnanism is not appropriate or where feedback response time must not exceed one second?		X			2	see 5.15.2.4
5.15.4.1.13 FEEDBACK FOR ERRONEOUS INPUT						
When control input errors are detected by the system, are error messages available as provided in 5.15.7.5, and error recovery procedures provided as in 5.15.7.8?		X			2	see 5.15.7.5
5.15.4.1.14 CONTROL INPUT DATA DISPLAY						
Is the presence and location of control input data entered by the user clearly and appropriately indicated?	X				2	
5.15.4.2 MENU SELECTION						
5.15.4.2.1 USE						
Is menu selection interactive control used for tasks that involve little or no entry of arbitrary data or where users may have relatively little training?	X				1	
5.15.4.2.2 SELECTION DEVICES						
Are lightpens or other pointing devices used for menu selection?			X		—	
5.15.4.2.3 ACTIVE OPTION PRESENTATION						
Does the system only present menu selection for actions which are currently available?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.4.2.4 FORMAT CONSISTENCY						
Are menus presented in a consistent format throughout the system and readily available at all times?	X				1	
5.15.4.2.5 OPTION SEQUENCE						
Are menu selections listed in a logical order, or in the order of frequency of need?	X				1	
5.15.4.2.6 SIMPLE MENUS						
When the number of selections can fit on one page in no more than two columns, is a simple menu used?	X				1	
5.15.4.2.7 OPTION PRESENTATION						
Are selection codes and associated descriptors presented on a single line?	X				1	
5.15.4.2.8 DIRECT FUNCTION CALL						
If several levels of hierarchical mens are used, is a direct function call capability provided so that the experienced user does not have to step through multiple menu levels?				X	—	
5.15.4.2.9 CONSISTENCY WITH COMMAND LANGUAGE						
When menu selection is employed to train in the use of a command language, is the wording and order consistent with the command language?			X		—	
5.15.4.2.10 OPTION CODING						
When selections are indicated by coded entry, is the code associated with each option included on the display in some consistent manner?	X				1	
5.15.4.2.11 KEYED CODES						
If menu selections are made by keyed codes, are the options coded by the first several letters of their displayed labels rather than by more arbitrary numeric codes?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.4.5 COMMAND LANGUAGE						
5.15.4.5.1 USE						
Is command language interactive control used for tasks involving a wide range of user inputs or where user familiarity with the system can take advantage of the flexibility and speed of the control?	X				1	
5.15.4.5.2 USER VIEWPOINT						
Does the command language reflect the user's point of view such that the commands are logically related to the user's conception of what is being done?	X				1	
5.15.4.5.3 DISTINCTIVENESS						
Are commands distinctive from one another?	X				1	
5.15.4.5.4 PUNCTUATION						
Is a minimum of punctuation or other special characters used in the command language?	X				1	
5.15.4.5.5 ABBREVIATIONS						
Is the user permitted to enter the full command name or abbreviation for any command of more than five characters?			X		—	
5.15.4.5.6 STANDARDIZATION						
Are commands and their abbreviations, if any, standardized and consistent with MIL-STD-411 or MIL-STD 783?			X		—	

*DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.4.5.7 DISPLAYED LOCATION						
Are commands entered and displayed in a standard location on the display?	X				1	
5.15.4.5.8 COMMAND PROMPTS						
Can the user requst prompts, as necessary, to determine required parameters in a command entry?			X		—	
5.15.4.6 SOFTWARE						
5.15.4.6.1 GENERAL						
Do computer programs provide adequate information and respond within required time limits with sufficient detail and precision to assure mission accomplishment while minimizing stress on the user?	X				3	
5.15.4.6.2 INFORMATION AND SYSTEM RESPONSE						
Is information displayed to the user, such as symbols, display codes, prompts, alerts, and alarms limited to that which is necessary to perform specific actions or to make decisions?	X				2	
5.15.4.6.3 COMPUTER FAILURE						
When the computer fails, does the computer program allow for the orderly shutdown and establishment of a check-point so restoration can be accomplished without loss of computing performed to date?		X			2	data would be lost

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.4.4.4 TASK COMPLEXITY						
Does the software minimize user task complexity?	X				2	
Are control inputs simplified as much as possible?	X				2	
5.5.15.4.4.5 INTERACTION						
Where two or more users must have simultaneous read access to the computer program or data processing results from multiple personnel-equipment interfaces, do the actions of one person not interfere with the operations of another?			X		—	
5.15.5 FEEDBACK						
5.15.5.1 STANDBACK						
Is feedback provided to the user as necessary to provide status information throughout the interaction?		X			2	not always, see 5.15.2.3
5.15.5.2 STAND-BY						
Is periodic feedback provided to the user to indicate normal system operation when the user is asked to stand-by?		X			2	
5.15.5.3 PROCESS OUTCOME						
When a control process or sequence is completed or aborted by the system, is a positive indication presented to the user concerning the outcome of the process and the requirements for subsequent user action?		X			2	not always
5.15.5.4 INPUT CONFIRMATION						
Does confirmation of user input occur without removing the data display?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITI-CALITY	COMMENTS
5.15.5.5 CURRENT MODES						
When multiple modes of operation exist, is a means provided to remind the user of the current mode?	X				2	
5.15.5.6 HIGHLIGHTED OPTION SELECTION						
When a displayed message or datum is selected as an option or input to the system, is the subject item highlighted to indicate acknowledgement by the system?		X			1	
5.15.5.7 USER INPUT REJECTION						
If the system rejects a user input, is feedback provided to indicate the reason for rejection and the required corrective action?		X			2	usually, but not always
Is feedback under these circumstances self explanatory?		X			2	" " "
5.15.6 PROMPTS						
5.15.6.1 USE						
Are prompts and help instructions used to explain commands, error messages, system capabilities, display formats, procedures, and sequences, and to provide data?	X				2	
5.15.6.2 STANDARD DISPLAY						
Are prompts displayed in a standardized area of displays?	X				1	
5.15.6.3 EXPLICIT PROMPTS						
Are prompts and help instructions for system-controlled dialogue explicit enough such that the user does not have to memorize lengthy sequences or refer to secondary written procedural references?	X				2	generally

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.6.4 PROMPT CLARITY						
Are prompts clear and understandable?	X				2	
Do they not require reference to coding schemes or conventions which may be unfamiliar to occasional users?		X			1	occasionally
5.15.6.5. DEFINITIONS						
Is a dictionary of abbreviations and codes available on-line?	X				1	
Are defintions of allowable options and ranges of values displayable at the user's request?	X				1	ranges are not always clear
5.15.6.6 CONSISTENT TERMINOLOGY						
Does on-line documentation, off-line documentation, and help instructions use consistent terminology?	X				2	
5.15.6.7 WORKLOAD REDUCTION						
Are default values used to reduce user workload?	X				1	especially in edit program
Are currently defined default values displayed automatically in their appropriate data fields with the initiation of a data entry transaction?	X				1	" " "
Can the user indicate acceptance of a default?	X				1	" " "
5.15.6.8 USER SELECTION						
Does the user have the option of generating default values based on operational experience if predefined appropriate values have not be accomplished?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITI-CALITY	COMMENTS
5.15.6.9 DEFAULT SUBSTITUTION						
Can the user replace any default value during a given transaction without changing the default definition?	X				1	
5.15.6.10 USER CONFIRMATION						
Is user acceptance of stored data or defaults possible with a single confirming keystroke?	X				1	
5.15.7 ERROR MANAGEMENT/DATA PROTECTION						
5.15.7.1 ERROR CORRECTION						
Where users are required to make entries into a system, is an easy means available for correcting erroneous entries?	X				2	
Does the system permit correction of individual errors without requiring re-entry of correctly entered commands or data elements?	X				2	
5.15.7.2 EARLY DETECTION						
Is there a capability provided which facilitates detection and correction of errors before they are entered into the system?	X				2	
Does error checking occur at logical data entry breaks to avoid disrupting the user?	X				2	
5.15.7.3 INTERNAL SOFTWARE CHECKS						
Are user errors minimized by use of internal software checks of user entries for validity of item, sequence of entry, completeness of entry, or range of values?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.7.4 CRITICAL ENTRIES						
Does the system require the user to acknowledge critical entries prior to their being implemented by the system?	X				2	
5.15.7.5 PROMPTING AND STRUCTURING						
Does the system contain prompting and help instructions designed to request additional or corrected information to provide orientation to the user throughout all interactive sessions and when an error is detected?	X				2	
Does prompting conform to:						
a. when operating in special modes, does the system display the mode designation and files being processed?			X		—	
b. does the system require user confirmation before processing user requests which might result in extensive or final changes to existing data?			X		—	
c. when missing data are detected, does the system prompt the user?			X		—	
d. when data entries or changes will be nullified by an abort action, is the user requested to confirm the abort?	X				2	
e. when the user signals logoff, does the system check pending transactions to determine if data loss seems probable?		X			2	
if yes, does the computer prompt for confirmation before the logoff command is executed?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
f. do sign-on processes require a minimum input from the user consistent with requirements prohibiting illegal entry?	X				2	
5.15.7.6 ERROR MESSAGE CONTENT						
Are error messages constructive and neutral in tone, avoiding phrases that suggest a judgment of the user's behavior?	X				2	
Do error messages reflect the user's view, and not that of the programmer?	X				2	in EDIT program, yes; other places, no; e.g., status=133?
Are error messages appropriate to the user's level of training and specific as possible to the user's particular application?		X			2	" " " "
5.15.7.7 ERROR RECOVERY AND PROCESS CHANGE						
Can the user stop the control process at any point in the sequence as a result of indicated error or as an option?				X	—	
Can the user return easily to previous levels in multi-step processes in order to nullify an error or to effect a desired change?				X	—	
5.15.7.8 DIAGNOSTIC INFORMATION						
Do error messages explicitly provide as much diagnostic information and remedial direction as can be inferred reliably from the error condition?	X				2	in EDIT program, yes; elsewhere, no
Where inference is not possible, are helpful inference(s) provided?		X			2	not always

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.7.9 CORRECTION ENTRY AND CONFIRMATION						
When a user enters a correction of an error, are such corrections implemented by an explicit action by the user (e.g., actuation of an ENTER key)?	X				2	
Are all error corrections by the user acknowledged by the system either by indicating a correct entry has been made or by another error message?		X			2	
5.15.7.10 SPELLING ERRORS						
Do spelling and other common errors produce invalid system commands or initiate transactions different from those intended?		X			2	relevant to authoring program only
Does the system recognize common misspellings of commands and execute the commands as if spelling had been correct?		X			1	
Are computer-corrected commands, values, and spellings displayed and highlighted for user confirmation?	X				1	
5.15.7.11 ERRORS IN STACKED COMMANDS						
Does the system display a prompt for errors in stacked commands?			X		—	
Can the user correct the error and salvage the stack?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.8 SYSTEM RESPONSE TIME						
Is system response time consistent with TABLE XXIX, 1472, page 247j?	X				2	
5.15.9. OTHER REQUIREMENTS						
5.15.9.2 HARD COPY						
Does the user have the capability of obtaining a paper copy of the exact contents of the alphanumeric or digital graphic displays where:						
a. mass storage is restricted?			X		—	
b. mass stored data can be lost by power interuption, or		X			3	
c. where record keeping is required?	X				3	

APPENDIX B
1472C-BASED CHECKLIST FOR THE SEVILLE/BURTEK DEVICE

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA CONTROL/DISPLAY INTEGRATION SECTION 5.1 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM INSTRUCTOR STATION COMPONENT

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.1 CONTROL/DISPLAY INTEGRATION						
5.1.1 GENERAL CRITERIA						
5.1.1.1. RELATIONSHIP						
Are relationships of controls to their associated displays, and displays to controls, immediately apparent to the operator?	X				3	
Are controls located adjacent to (normally under or to the right of) their associated displays and positioned so that neither the control nor the hand normally used for setting the control will obscure the display?	X				1	
5.1.1.2 DESIGN						
Are control-display relationships apparent to the user through proximity, similarity of groupings, coding, framing, labeling, and similar techniques?	X				2	
5.1.1.3 COMPLEXITY AND PRECISION						
Is complexity and precision required of control manipulation and display monitoring consistent with the precision required of the system?	X				2	
Does control/display complexity match the capability of the operator (in terms of discrimination of display detail), or match the operator's manipulative capability under the dynamic conditions and environment in which human performance is expected to occur?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.1.1.4 FEEDBACK						
Is feedback on control response adequacy provided as rapidly as possible?	X				2	via CRT display
Do critical control functions, such as those entered by keyboard, provide adequate feedback to the operator prior to entry to ensure that the keyed entry is, in fact, errorless and the one that the operator desires to enter?	X				2	error message if not done correctly
5.1.2 POSITIONAL RELATIONSHIPS						
5.1.2.1 FUNCTIONAL GROUPING						
Are functionally-related controls and displays located in proximity to one another--arrange in functional groups, e.g., power, status, test, etc.?	X				2	
5.1.2.1.1 FUNCTIONAL GROUP ARRANGEMENT						
5.1.2.1.1.1 SEQUENCE						
Are functionally related groups of controls and displays located so as to provide for left-to-right (preferred) or top-to-bottom order of use, or both?			X		—	
5.1.2.1.1.2 ACCESS						
Are functionally-related groups of controls and displays which are more frequently used, located in areas of easiest access?	X				1	
5.1.2.1.1.3 FUNCTIONAL GROUP MARKING						
Are functional groups set apart by outlining with contrasting lines which completely encompass the groups?	X				1	instructor/student controls

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.1.2.1.1.4 CONSISTENCY						
Is the location of recurring functional groups and individual items similar from panel to panel?			X		—	
5.1.2.3 ARRANGEMENT WITHIN GROUPS						
Are controls and displays within functional groups located according to operation sequence or function, or both?	X				2	
5.1.3 MOVEMENT RELATIONSHIPS						
5.1.3.1 LACK OF AMBIGUITY						
Do display indicators clearly and unambiguously direct and guide the appropriate control response?	X				2	generally
Is the response of the display to control movements consistent, predictable, and compatible with the operator's expectations?	X				2	
5.1.3.2 TIME LAG						
Is the time lag between the response of the system to a control input and the display presentation of the response, minimized?	X				2	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA CONTROL/DISPLAY INTEGRATION SECTION 5.1 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM STUDENT STATION COMPONENT

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.1 CONTROL/DISPLAY INTEGRATION						
5.1.1 GENERAL CRITERIA						
5.1.1.1. RELATIONSHIP						
Are relationships of controls to their associated displays, and displays to controls, immediately apparent to the operator?	X				3	
Are controls located adjacent to (normally under or to the right of) their associated displays and positioned so that neither the control nor the hand normally used for setting the control will obscure the display?	X				1	
5.1.1.2 DESIGN						
Are control-display relationships apparent to the user through proximity, similarity of groupings, coding, framing, labeling, and similar techniques?	X				2	
5.1.1.3 COMPLEXITY AND PRECISION						
Is complexity and precision required of control manipulation and display monitoring consistent with the precision required of the system?	X				2	
Does control/display complexity match the capability of the operator (in terms of discrimination of display detail), or match the operator's manipulative capability under the dynamic conditions and environment in which human performance is expected to occur?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.1.1.4 FEEDBACK						
Is feedback on control response adequacy provided as rapidly as possible?	X				2	via CRT
Do critical control functions, such as those entered by keyboard, provide adequate feedback to the operator prior to entry to ensure that the keyed entry is, in fact, errorless and the one that the operator desires to enter?	X				2	
5.1.2 POSITIONAL RELATIONSHIPS						
5.1.2.1 FUNCTIONAL GROUPING						
Are functionally-related controls and displays located in proximity to one another--arrange in functional groups, e.g., power, status, test, etc.?	X				2	
5.1.2.1.1 FUNCTIONAL GROUP ARRANGEMENT						
5.1.2.1.1.1 SEQUENCE						
Are functionally related groups of controls and displays located so as to provide for left-to-right (preferred) or top-to-bottom order of use, or both?			X		—	
5.1.2.1.1.2 ACCESS						
Are functionally-related groups of controls and displays which are more frequently used, located in areas of easiest access?	X				1	
5.1.2.1.1.3 FUNCTIONAL GROUP MARKING						
Are functional groups set apart by outlining with contrasting lines which completely encompass the groups?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.1.2.1.1.4 CONSISTENCY						
Is the location of recurring functional groups and individual items similar from panel to panel?			X		—	
5.1.2.3 ARRANGEMENT WITHIN GROUPS						
Are controls and displays within functional groups located according to operation sequence or function, or both?	X				2	
5.1.3 MOVEMENT RELATIONSHIPS						
5.1.3.1 LACK OF AMBIGUITY						
Do display indicators clearly and unambiguously direct and guide the appropriate control response?	X				2	generally, however, some procedural actions (e.g., "test" vs. "inspect" not absolutely clear
Is the response of the display to control movements consistent, predictable, and compatible with the operator's expectations?	X				2	
5.1.3.2 TIME LAG						
Is the time lag between the response of the system to a control input and the display presentation of the response, minimized?	X				2	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA VISUAL DISPLAYS SECTION 5.2 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM INSTRUCTOR STATION COMPONENT

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2 VISUAL DISPLAYS 5.2.1 GENERAL						
Are visual displays used to provide the operator with a clear indication of equipment or system conditions for operation under any eventuality commensurate with the operational and maintenance philosophy under design?	X				4	
5.2.1.1. ALERTING/WARNING RELIABILITY						
Do alerting/warning displays provide the operator with a greater probability of detecting the triggering condition than normal observation would provide in the absence of the displays?	X				3	
5.2.1.3.1 CONTENT						
Is information displayed to the operator limited to that which is necessary to perform specific ations or to make decisions?	X				3	
5.2.1.3.2 PRECISION						
Is the information displayed only within the limits and precision required for specific operator actions or decisions?	X				3	
5.2.1.3.3 FORMAT						
Is information presented to the operator in a directly usable form?	X				3	
Is the need for transposing, computing, interpolating, or mentally translating into other units avoided?	X				3	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.1.3.4 REDUNDANCY						
Is display redundancy avoided except in those circumstances where it is needed to achieve reliability?	X				1	
5.2.1.3.5 COMBINING OPERATOR/ MAINTAINER INFORMATION						
Is operator and maintainer information combined in the same display only when the information content and format are well-suited to, and time compatible for, both users?	X				2	
5.2.1.3.6 DISPLAY FAILURE CLARITY						
Is failure of a display or its circuit immediately apparent to the operator?	X				2	usually, but not always
5.2.1.3.7 DISPLAY CIRCUIT FAILURE						
Is display circuitry separate from equipment it monitors such that a failure in the display does not cause a failure in equipment?				X	—	
5.2.1.3.8 UNRELATED MARKINGS						
Are trademarks and company names placed elsewhere other than on the display panel face?	X				1	
5.2.1.3.9 DURATION						
Do signals and display information have durations of sufficient length to be reliably detected under expected operator workload and the operational environment?	X				3	
5.2.1.3.10 TIMELINESS						
Are displays such as cathode ray tube displays, head-up displays, collimated displays and other displays requiring refreshed information updated in a synchronous manner, where possible?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
Are the displays refreshed to the degree of timeliness required by personnel in the normal operating and/or servicing modes?	X				2	
5.2.1.3.11 ADVISORY AND ALERTING						
Do displays such as multifunction displays, cathode ray tube displays, head-up diplays, collimate displays and other visual display devices which display simultaneous and integrated information advise and alert operating personnel to information that becomes critical within the display?	X				2	
5.2.1.4 LOCATION AND ARRANGEMENT						
5.2.1.4.1 LOCATION						
Are displays located and designed so that they may be read to the degree of accuracy required by personnel in the normal operating or servicing positions without requiring the operator to assume an uncomfortable, awkward or unsafe position?	X				2	
5.2.1.4.2 ACCESS						
Are visual displays visually accessible without resorting to the use of ladders, flashlights or other special equipment?	X				2	
5.2.1.4.3 ORIENTATION						
Are display faces perpendicular to the operator's line of sight when feasible?	X				1	
Is parallax minimal?	X				1	
5.2.1.4.4 REFLECTION						
Are displays constructed, arranged and mounted to prevent reduction of information transfer due to reflection of the ambient illumination from the display cover?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.1.4.6 GROUPING						
Are all displays necessary to support an operator activity or sequence of activities, grouped together?	X				2	CRT, printer, etc.
5.2.1.4.7 FUNCTION AND SEQUENCE						
Are displays arranged in relation to one another according to their sequence of use or the functional relations of the components they represent?	X				2	
5.2.1.4.8 FREQUENCY OF USE						
Are displays that are frequently used grouped together and placed in an optimum visual zone?	X				2	
5.2.1.4.9 IMPORTANCE						
Are important or critical displays located in a privileged position in the optimum projected visual zone or otherwise highlighted?	X				2	
5.2.1.4.10 CONSISTENCY						
Are similar displays arranged consistently within the assembly or across similar assemblies?			X		—	
5.2.1.4.11 MAXIMUM VIEWING DISTANCE						
Is the viewing distance from the eye reference point of the seated operator to displays located close to their associated controls? (less than 635mm (25 in))	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.1.5 CODING						
5.2.1.5.1 OBJECTIVES						
Are coding techniques used to facilitate:						
a. discrimination of individual displays?			X		—	
b. identification of functionally related displays?			X		—	
c. indication of relationships between displays?			X		—	
d. identification of critical information within a display?	X				2	
5.2.1.5.2 TECHNIQUES						
Are displays coded by color, size, location, shape or flash coding, as applicable?			X		—	
5.2.1.5.3 STANDARDIZATION						
Is coding within the system uniform and established by agreement with the procuring activity?			X		—	
5.2.2.3 SIMPLE INDICATOR LAMPS						
5.2.2.3.1 USE						
Are simple indicator lamps used when design considerations preclude the use of legend lights?	X				1	computer "on" position
5.2.2.3.2 SPACING						
Is the spacing between adjacent edges of simple round indicator lamps sufficient to permit unambiguous labeling, signal interpretation, and convenient bulb removal?			X		—	
5.2.2.3.3 CODING						
Are simple indicator lights coded in conformance with TABLE II, page, 33, 1472c?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.4 CATHODE RAY TUBE (CRT) DISPLAYS						
5.2.4.1 SIGNAL SIZE						
Is the image size of characters consistent with operator needs and requirements?	X				2	
5.2.4.2 VIEWING DISTANCE						
Is the viewing distance consistent with operator needs and requirements?	X				1	
5.2.4.3 SCREEN LUMINANCE						
Does the ambient illuminance contribute more than 25% of screen brightness through diffuse reflection and phosphor excitation?	X				1	
5.2.4.5 LUMINANCE RANGE						
Is the luminance range of surfaces immediately adjacent to scopes between 10% and 100% of screen background luminance?	X				1	
5.2.4.6 AMBIENT ILLUMINANCE						
Is the ambient illuminance in the CRT area appropriate for other visual functions (e.g., setting controls, reading instruments, etc) but not such that interference with the reading of the CRT is imperiled?	X				1	
5.2.4.7 REFLECTED GLARE						
Is reflected glare minimized by proper placement of the scope relative to the light source? (are hoods and shields used?)	X				1	
5.2.4.8 ADJACENT SURFACES						
Are surfaces adjacent to the scope of a dull matte finish?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.6 OTHER DISPLAYS						
5.2.6.1 GENERAL						
5.2.6.1.1 TYPES						
Where applicable, are direct-reading counters, printers, plotters flags, optical projections, LED, gas discharge, liquid crystal and electroluminescent displays used?	X				1	printer
5.2.6.1.2 APPLICATIONS						
Is the selection of the displays mentioned in 5.2.6.1.1 based on specific criteria as per TABLE III, 1472C, page 35?	X				1	
5.2.6.2 COUNTERS						
5.2.6.2.1 USE						
Are counters used for presenting quantitative data when a continuous trend indication is not required and when a quick, precise indication is needed?			X		—	
5.2.6.2.2 MOUNTING						
Are counters mounted as close as possible to the panel surface so as to mimize parallax and shadows and maximize the viewing angle?			X		—	
5.2.6.3 PRINTERS						
5.2.6.3.1 USE						
Are printers used when a visual record of data is necessary or desirable?	X				2	
Do printers confora to TABLE III 1072C, page 35.	X				1	
5.2.6.3.2 VISIBILITY						
Is printed matter not hidden, masked, or obscured in a manner that does not impair direct reading?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.6.3.3 CONTRAST						
Is a minimum of 75% luminance contrast provided between the material and the background on which it is printed?	X				1	
5.2.6.3.4 ILLUMINATION						
Are printers provided with internal illumination if the printed matter is not legible in the planned operational ambient environment?			X		—	
5.2.6.3.5 TAKE-UP PROVISION						
Is a take-up device for printed material provided?		X			1	
5.2.6.3.6 ANNOTATION						
Where applicable, are printers mounted so that the printed matter (e.g., paper, metalized paper) may be easily annotated while still in the printer?	X				1	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA VISUAL DISPLAYS SECTION 5.2 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM STUDENT STATION COMPONENT

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2 VISUAL DISPLAYS 5.2.1 GENERAL						
Are visual displays used to provide the operator with a clear indication of equipment or system conditions for operation under any eventuality commensurate with the operational and maintenance philosophy under design?	X				4	
5.2.1.1 ALERTING/WARNING RELIABILITY						
Do alerting/warning displays provide the operator with a greater probability of detecting the triggering condition than normal observation would provide in the absence of the displays?	X				3	
5.2.1.3.1 CONTENT						
Is information displayed to the operator limited to that which is necessary to perform specific actions or to make decisions?	X				3	
5.2.1.3.2 PRECISION						
Is the information displayed only within the limits and precision required for specific operator actions or decisions?	X				3	
5.2.1.3.3 FORMAT						
Is information presented to the operator in a directly usable form?	X				3	
Is the need for transposing, computing, interpolating, or mentally translating into other units avoided?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.1.3.4 REDUNDANCY						
Is display redundancy avoided except in those circumstances where it is needed to achieve reliability?	X				1	
5.2.1.3.5 COMBINING OPERATOR/ MAINTAINER INFORMATION						
Is operator and maintainer information combined in the same display only when the information content and format are well-suited to, and time compatible for, both users?			X		—	
5.2.1.3.6 DISPLAY FAILURE CLARITY						
Is failure of a display or its circuit immediately apparent to the operator?		X			2	
5.2.1.3.7 DISPLAY CIRCUIT FAILURE						
Is display circuitry separate from equipment it monitors such that a failure in the display does not cause a failure in equipment?				X	—	
5.2.1.3.8 UNRELATED MARKINGS						
Are trademarks and company names placed elsewhere other than on the display panel face?	X				1	
5.2.1.3.9 DURATION						
Do signals and display information have durations of sufficient length to be reliably detected under expected operator workload and the operational environment?	X				3	
5.2.1.3.10 TIMELINESS						
Are displays such as cathode ray tube displays, head-up displays, collimated displays and other displays requiring refreshed information updated in a synchronous manner, where possible?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
Are the displays refreshed to the degree of timeliness required by personnel in the normal operating and/or servicing modes?	X				2	
5.2.1.3.11 ADVISORY AND ALERTING						
Do displays such as multifunction displays, cathode ray tube displays, head-up diplays, collimate displays and other visual display devices which display simultaneous and integrated information advise and alert operating personnel to information that becomes critical within the display?	X				2	
5.2.1.4 LOCATION AND ARRANGEMENT						
5.2.1.4.1 LOCATION						
Are displays located and designed so that they may be read to the degree of accuracy required by personnel in the normal operating or servicing positions without requiring the operator to assume an uncomfortable, awkward or unsafe position?	X				2	CRT & 2x2 slides
5.2.1.4.2 ACCESS						
Are visual displays visually accessible without resorting to the use of ladders, flashlights or other special equipment?	X				2	
5.2.1.4.3 ORIENTATION						
Are display faces perpendicular to the operator's line of sight when feasible?	X				1	
Is parallax minimal?		X			1	
5.2.1.4.4 REFLECTION						
Are displays constructed, arranged and mounted to prevent reduction of information transfer due to reflection of the ambient illumination from the display cover?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.1.4.6 GROUPING Are all displays necessary to support an operator activity or sequence of activities, grouped together?	X				2	CRT & Slide projection are close at hand
5.2.1.4.7 FUNCTION AND SEQUENCE Are displays arranged in relation to one another according to their sequence of use or the functional relations of the components they represent?	X				2	
5.2.1.4.8 FREQUENCY OF USE Are displays that are frequently used grouped together and placed in an optimum visual zone?	X				2	
5.2.1.4.9 IMPORTANCE Are important or critical displays located in a privileged position in the optimum projected visual zone or otherwise highlighted?	X				2	
5.2.1.4.10 CONSISTENCY Are similar displays arranged consistently within the assembly or across similar assemblies?			X		—	
5.2.1.4.11 MAXIMUM VIEWING DISTANCE Is the viewing distance from the eye reference point of the seated operator to displays located close to their associated controls? (less than 635mm (25 in))	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.1.5 CODING						
5.2.1.5.1 OBJECTIVES						
Are coding techniques used to facilitate:						
a. discrimination of individual displays?			X		—	
b. identification of functionally related displays?			X		—	
c. indication of relationships between displays?			X		—	
d. identification of critical information within a display?			X		—	
5.2.1.5.2 TECHNIQUES						
Are displays coded by color, size, location, shape or flash coding, as applicable?			X		—	
5.2.1.5.3 STANDARDIZATION						
Is coding within the system uniform and established by agreement with the procuring activity?			X		—	
5.2.2.3 SIMPLE INDICATOR LAMPS						
5.2.2.3.1 USE						
Are simple indicator lamps used when design considerations preclude the use of legend lights?			X		—	
5.2.2.3.2 SPACING						
Is the spacing between adjacent edges of simple round indicator lamps sufficient to permit unambiguous labeling, signal interpretation, and convenient bulb removal?			X		—	
5.2.2.3.3 CODING						
Are simple indicator lights coded in conformance with TABLE II, sage, 33, 1472c?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.4 CATHODE RAY TUBE (CRT) DISPLAYS						
5.2.4.1 SIGNAL SIZE						
Is the image size of characters consistent with operator needs and requirements?	X				2	student CRT
5.2.4.2 VIEWING DISTANCE						
Is the viewing distance consistent with operator needs and requirements?	X				1	
5.2.4.3 SCREEN LUMINANCE						
Does the ambient illuminance contribute more than 25% of screen brightness through diffuse reflection and phosphor excitation?	X				1	
5.2.4.5 LUMINANCE RANGE						
Is the luminance range of surfaces immediately adjacent to scopes between 10% and 100% of screen background luminance?	X				1	
5.2.4.6 AMBIENT ILLUMINANCE						
Is the ambient illuminance in the CRT area appropriate for other visual functions (e.g., setting controls, reading instruments, etc) but not such that interference with the reading of the CRT is imperiled?	X				1	
5.2.4.7 REFLECTED GLARE						
Is reflected glare minimized by proper placement of the scope relative to the light source? (are hoods and shields used?)	X				1	
5.2.4.8 ADJACENT SURFACES						
Are surfaces adjacent to the scope of a dull matte finish?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.6 OTHER DISPLAYS						
5.2.6.1 GENERAL						
5.2.6.1.1 TYPES						
Where applicable, are direct-reading counters, printers, plotters flags, optical projections, LED, gas discharge, liquid crystal and electroluminescent displays used?	X				1	2x2 slide projection
5.2.6.1.2 APPLICATIONS						
Is the selection of the displays mentioned in 5.2.6.1.1 based on specific criteria as per TABLE III, 1472C, page 35?			X		—	
5.2.6.2 COUNTERS						
5.2.6.2.1 USE						
Are counters used for presenting quantitative data when a continuous trend indication is not required and when a quick, precise indication is needed?			X		—	
5.2.6.2.2 MOUNTING						
Are counters mounted as close as possible to the panel surface so as to minize parallax and shadows and maximize the viewing angle?			X		—	
5.2.6.3 PRINTERS						
5.2.6.3.1 USE						
Are printers used when a visual record of data is necessary or desirable?			X		—	
Do printers confere to TABLE III 1072C, page 35.			X		—	
5.2.6.3.2 VISIBILITY						
Is printed matter not hidden, masked, or obscured in a manner that does not impair direct reading?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.2.6.3.3 CONTRAST						
Is a minimum of 75% luminance contrast provided between the material and the background on which it is printed?			X		—	
5.2.6.3.4 ILLUMINATION						
Are printers provided with internal illumination if the printed matter is not legible in the planned operational ambient environment?			X		—	
5.2.6.3.5 TAKE-UP PROVISION						
Is a take-up device for printed material provided?			X		—	
5.2.6.3.6 ANNOTATION						
Where applicable, are printers mounted so that the printed matter (e.g., paper, metalized paper) may be easily annotated while still in the printer?			X		—	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA AUDIO DISPLAYS SECTION 5.3 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM _____ COMPONENT _____

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.3 AUDIO DISPLAYS						
5.3.1 GENERAL						
5.3.1.1 USE						
Are audio displays provided when:						
a. The information to be processed is short, simple, and transitory, requiring immediate or time-based responses?	X				2	But instructor, call, error in entry
b. The common mode of visual display is restricted by overburdening; ambient light variability or limitation operator mobility; degradation of vision by vibration, high g-forces, hypoxia, or other environmental considerations; or anticipated operator inattention?			X		—	
c. The criticality of transmission response makes supplementary or redundant transmission desireable?	X				2	
d. It is desirable to warn, alert, or cue the operator to subsequent additional response?	X				2	
e. Custom or usage has created anticipation of an audio display?			X		—	
f. Voice communication is necessary or desireable?	X				2	help needed from instructor
5.3.1.2 SIGNAL TYPE						
When an audio presentation is required, is the signal presented in accordance with Table V, 1472c, page 52?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.3.1.3 FALSE ALARMS						
Does the audio display device preclude circuit false alarms?	X				2	
5.3.1.5 CIRCUIT TEST						
Are audio displays equipped with circuit test devices or other means of operability tests?		X			1	
5.3.2 AUDIO WARNINGS						
5.3.2.1 WARNING SIGNALS						
Are audio signals provided, as necessary, to warn personnel of impending danger, to alert an operator to a critical change in system or equipment status, and to remind the operator of a critical action or actions that must be taken?	X				2	errors; student needs help
5.3.2.4 RELATION TO VISUAL DISPLAYS						
When used in conjunction with visual displays; are audio warning devices supplementary or supportive?	X				2	
Does the audio signal alert and direct operator attention to the appropriate visual display?	X				2	
5.3.3 CHARACTERISTICS OF AUDIO WARNING SIGNALS						
5.3.3.1 FREQUENCY						
5.3.3.1.1 RANGE						
Is the range of the warning signals between 200 and 5000 hz. (preferably between 500 and 3000 hz.)?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.3.3.2 INTENSITY						
5.3.3.2.1 COMPATIBILITY WITH ACOUSTICAL ENVIRONMENT						
Is the intensity, duration and source location of audio alarms and signals compatible with the acoustical environment of the intended receiver as well as the requirements of other personel in the signal area?	X				1	
5.3.3.2.2 DISCOMFORT						
Is the intensity of audio warning signals low enough such that discomfort and/or "ringing" is not caused in the ears of listeners?	X				2	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA CONTROLS SECTION 5.4 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM INSTRUCTOR STATION COMPONENT

DESIGN CRITERIA	YES	NO	N/A	UNK	CRIT?. CALITY	COMMENTS
5.4 CONTROLS						
5.4.1 BENERAL CRITERIA						
5.4.1.1 SELECTION						
5.4.1.1.1 DISTRIBUTION OF WORK .LOAD						
Are controls selected and distributed so that none of the operator's limbs are overburdened?	X				1	very easy and simple to operate
5.4.1.1.5 STOPS						
Are stops provided at the beginning and end of the range of control position if the control is not required to be operated beyond a particular end position or specified limit?	X				1	
5.4.1.2. DIRECTION OF MOVEMENT						
5.4.1.2.1 CONSISTENCY OF MOVEMENT						
Is the direction of control movement consistent with the related movement of an associated display, equipment component, or vehicle?			X		—	CRT response

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4 CONTROLS 5.4.1.3 ARRANGEMENT AND GROUPING						
5.4.1.3.1 GROUPING Are all controls which function in sequential operation, or which operate together, grouped together along with their associated displays?	X				1	
5.4.1.3.2 SEQUENTIAL OPERATIONS Do controls which are involved in sequential operations follow a fixed pattern?	X				1	
5.4.1.3.3 LOCATION OF PRIMARY CONTROLS Do the most important and frequently used controls have a favorable position with respect to ease of use?	X				1	
5.4.1.3.4 CONSISTENCY Are functionally similar or identical primary controls arranged consistently from panel to panel throughout the system, equipment, etc.?	X				1	
5.4.1.3.7. SPACING Does spacing between controls comply with Table VII (page 65) in Mil-Std-1472c?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.1.4 CODING						
5.4.1.4.1 METHODS AND REQUIREMENTS						
Where coding of controls is used, is it consistent throughout the system?	X				1	
5.4.1.4.2 LOCATION CODING						
Are controls associated with similar functions in the same relative location?	X				1	
5.4.1.5 LABELING OF CONTROLS						
Does control labeling confora the criteria set forth in paragraph 5.5?	X				1	
5.4.1.8 PREVENTION OF ACCIDENTAL ACTIVATION						
5.4.1.8.1 LOCATION AND DESIGN						
Are controls designed and located so that they are not susceptible to accidental activation?			X		—	
5.4.2.1.2 KEY OPERATED SWITCHES						
5.4.2.1.1 USE						
Are key operated switches used to prevent unauthorized operation?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.2.1.2.2 DIMENSIONS, DISPLACEMENT AND RESISTANCE						
Do the dimensions, displacement, and resistance of key operated switches confore to Figure 5, 1472C?			X		—	
5.4.2.1.2.4 MARKING AND LABELING						
Does the keylock application include appropriate positional markings and labels?			X		—	
5.4.2.1.2.5 OTHER REQUIREMENTS						
Do keys have teeth on both edges?			X		—	
Is key lock orfented so that the key's vertical position is the off position?			X		—	
Can the key be removed only when the lock is in the off position?			X		—	
Is activation of the system accomplished by turning the key in a clockwise direction?			X		—	
5.4.2.1.3 DISCRETE THUMBWHEEL CONTROLS						
5.4.2.1.3.1 APPLICATION						
Are thumbwheel controls used where precise numberical inputs are required on the part the operator?	X				1	exercise selection

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.2.1.3.2 SHAPE						
Are positions around the circumference of discrete thumbwheel controls provided with a concave surface or separated by a high-friction area which is raised from the periphery of the thumb-wheel?			X		—	
Do thumbwheels not preclude viewing the digits within 30 degrees viewing angle to the left and right of a perpendicular to the thumbwheel digits?	X				1	
5.4.2.1.3.3 CODING						
Are thumbwheel controls coded by loction, labeling, and color?			X		—	
If used as input devices, are OFF and ON positions color coded to permit a visual check that the digits have been reset to their normal positions?			X		—	
5.4.2.1.3.4 DIRECTION OF MOVEMENT						
Does moving the thumbwheel edge forward, or upward, or to the right increase the setting?		X			1	decreases setting
5.4.2.1.3.5 NUMERALS						
5.4.2.1.3.5.1 EXTERNAL LUMINANCE						
Are digits bold, black numerals engraved on a light (or white) thumbwheel background?		X			1	white on black
Is the height-to-stroke width ratio approximately 10:1?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.2.1.3.6 VISIBILITY						
Does thumbwheel design permit viewing of inline digital readout from all operator positions?	X				1	
5.4.2.1.3.7 DIMENSIONS						
Do thumbwheel control dimensions conform to the criteria set forth in Figure 6, 1472, page 77?	X				1	
5.4.2.1.3.8 RESISTANCE						
Is control resistance elastic?	X				1	
Does resistance build up and then decrease as each detent is approached so that the control snaps into position without stopping between adjacent detents?	X				1	
5.4.2.1.3.9 SEPARATION						
Does separation between adjacent edges of thumbwheel controls conform to the criteria in Figure 6, 1472c and sufficient to preclude accidental activation of adjacent controls during normal setting?	X				1	
5.4.3 LINEAR CONTROLS						
5.4.3.1 DISCRETE LINEAR CONTROLS						
5.4.3.1.1 PUSH BUTTONS (FINGER OR HAND OPERATED)						
5.4.3.1.1.1 USE						
Are push button used when a control or an array of controls is needed for momentary contact or for activating a locking circuit, particularly in high-frequency-of-use situations?	X				1	instructor console switches

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.1.2 SHAPE						
Are push button surfaces concave (indented) so as to fit the finger?		X			1	not necessary
Does the surface provide a high degree of frictional resistance to prevent slipping?	X				1	
5.4.3.1.1.3 POSITIVE INDICATION						
Does control activation produce a positive indication of that activation (e.g., snap feel, audible click, or integral light)?	X				1	click
5.4.3.1.1.4 CHANNEL OR COVER GUARD						
Is a channel or cover guard used when it is imperative to prevent accidental activation of the controls?			X		—	
Do cover guards, in the open position, not interfere with operation of the protected device or adjacent controls?			X		—	
5.4.3.1.1.5 DIMENSIONS, RESISTANCE, DISPLACEMENT, AND SEPARATION						
Do push button dimensions, resistances, displacements, and separations conform to the criteria set forth in Figure 11, 1472c, page 88?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.4 TOGGLE SWITCH CONTROLS						
5.4.3.1.4.1 USE						
Are toggle switches used for functions which require two discrete positions or where space limitations are severe?	X				1	computer cabinet
5.4.3.1.4.2 ACCIDENTAL ACTIVATION						
When the prevention of accidental activation is of primary importance (i.e., critical, dangerous, or hazardous conditions would result) are channel guards, lift-to-unlock switches, or other equivalent prevention mechanisms provided?		X			1	not necessary
Is safety or lock wire not used?	X				1	
If a cover guard is used, does its location interfere with the operation of the protected device or adjacent controls?			X		—	
5.4.3.1.4.3 DIMENSIONS, RESISTANCE DISPLACEMENT, AND SEPARATION						
Do dimensions, resistances, displacements, and separations between adjacent edges of toggle switches conform to the criteria set forth in Figure 13, 1472c, page 937			X		—	
Can toggle switches be stopped only at numerical positions?	X				1	
5.4.3.1.4.4 POSITIVE INDICATION						
Is an indication of control activation provided (e.g., snap feel, audible click, associated or integral light)?	X				1	"snap feel" and "click"

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.4.5 ORIENTATION						
Are toggle switches vertically oriented with OFF in the down position?	X				1	
Is horizontal orientation and actuation used only for compatibility with the controlled function or equipment location?			X		—	
5.4.3.1.6 ROCKER SWITCHES						
5.4.3.1.6.1 USE						
Are rocker switches used in lieu of toggle switches for functions which require two discrete positions?	X				1	power supply
Are rocker switches used where toggle switch handle protusions might snag the operator's sleeve or phone cord, or where there is insufficient panel space for separate labeling of switch positions?			X		—	
5.4.3.1.6.2 ACCIDENTAL ACTIVATION						
Are channel guards or equivalent protective measures used when the prevention of accidental activation is of primary importance (e.g., critical, dangerous or hazardous conditions would result?		X			1	not necessary
5.4.3.1.6.3 POSITIVE INDICATION						
Is an indication of control activation provided (e.g., snap feel, audible click, associated or integral light)?	X				1	click

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.6.4 DIMENSIONS, RESISTANCE DISPLACEMENT, AND SEPARATION						
Do dimensions, resistances, displacements, and separations between centers of rocker switches conform to the criteria in Figure 15, 1472c, page 96?	X				1	
Does resistance gradually increase, and then drop when the switch snaps into position?	X				1	
Can the switch be stopped only at the required positions?	X				1	
5.4.3.1.6.6 ORIENTATION						
Where practicable, are rocker switches mounted vertically?	X				1	
Does activation of the upper wing turn the equipment or component on?	X				1	
Is horizonal orientation of rocker switches used only for compatibility with the controlled function or equipment location?			X		—	
5.4.3.1.6.7 COLOR AND ILLUMINATION						
Are alternate colors used to denote the ON and OFF positions of a rocker switch?			X		—	
Is alternate illumination of either the ON or OFF positions used to facilitate positive recognition of current switch position?			X		—	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA CONTROLS SECTION 5.4 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM STUDENT STATION COMPONENT

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4 CONTROLS						
5.4.1 GENERAL CRITERIA						
5.4.1.1 SELECTION						
5.4.1.1.1 DISTRIBUTION OF WORK LOAD						
Are controls selected and distributed so that none of the operator's limbs are overburdened?	X				1	easy & simple to operate
5.4.1.1.5 STOPS						
Are stops provided at the beginning and end of the range of control position if the control is not required to be operated beyond a particular end position or specified limit?	X				1	
5.4.1.2. DIRECTION OF MOVEMENT						
5.4.1.2.1 CONSISTENCY OF MOVEMENT						
Is the direction of control movement consistent with the related movement of an associated display, equipment component, or vehicle?			X		—	CRT response/slide presentation

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4 CONTROLS 5.4.1.3 ARRANGEMENT AND GROUPING						
5.4.1.3.1 GROUPING						
Are all controls which function in sequential operation, or which operate together, grouped together along with their associated displays?	X				1	
5.4.1.3.2 SEQUENTIAL OPERATIONS						
Do controls which are involved in sequential operations follow a fixed pattern?	X				1	generally
5.4.1.3.3 LOCATION OF PRIMARY CONTROLS						
Do the most important and frequently used controls have a favorable position with respect to ease of use?	X				1	
5.4.1.3.4 CONSISTENCY						
Are functionally similar or identical primary controls arranged consistently from panel to panel throughout the system, equipment, etc.?	X				1	
5.4.1.3.7. SPACING						
Does spacing between controls comply with Table VII (page 65) in Mil-Std-1472c?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.1.4 CODING						
5.4.1.4.1 METHODS AND REQUIREMENTS						
Where coding of controls is used, is it consistent throughout the system?	X				1	
5.4.1.4.2 LOCATION CODING						
Are controls associated with similar functions in the same relative location?	X				1	
5.4.1.5 LABELING OF CONTROLS						
Does control labeling conform the criteria set forth in paragraph 5.5?	X				1	
5.4.1.8 PREVENTION OF ACCIDENTAL ACTIVATION						
5.4.1.8.1 LOCATION AND DESIGN						
Are controls designed and located so that they are not susceptible to accidental activation?			X		—	not a problem
5.4.2.1.2 KEY OPERATED SWITCHES						
5.4.2.1.1 USE						
Are key operated switches used to prevent unauthorized operation?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITI-CALITY	COMMENTS
5.4.2.1.2 DIMENSIONS, DISPLACEMENT AND RESISTANCE						
Do the dimensions, displacement, and resistance of key operated switches conform to Figure 5, 1472C?			X		—	
5.4.2.1.4 MARKING AND LABELING						
Does the keylock application include appropriate positional markings and labels?			X		—	
5.4.2.1.2.5 OTHER REQUIREMENTS						
Do keys have teeth on both edges?			X		—	
Is key lock oriented so that the key's vertical position is the off position?			X		—	
Can the key be removed only when the lock is in the off position?			X		—	
Is activation of the system accomplished by turning the key in a clockwise direction?			X		—	
5.4.2.1.3 DISCRETE THUMBWHEEL CONTROLS						
5.4.2.1.3.1 APPLICATION						
Are thumbwheel controls used where precise numberical inputs are required on the part the operator?	X				1	component selection

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.2.1.3.2 SHAPE						
Are positions around the circumference of discrete thumbwheel controls provided with a concave surface or separated by a high-friction area which is raised from the periphery of the thumb-wheel?			X		—	
Do thumbwheels not preclude viewing the digits within 30 degrees viewing angle to the left and right of a perpendicular to the thumbwheel digits?	X				1	
5.4.2.1.3.3 CODING						
Are thumbwheel controls coded by loction, labeling, and color?			X		—	
If used as input devices, are OFF and ON positions color coded to permit a visual check that the digits have been reset to their normal positions?			X		—	
5.4.2.1.3.4 DIRECTION OF MOVEMENT						
Does moving the thumbwheel edge forward, or upward, or to the right increase the setting?		X			1	decreases setting
5.4.2.1.3.5 NUMERALS						
5.4.2.1.3.5.1 EXTERNAL LUMINANCE						
Are digits bold, black numerals engraved on a light (or white) thumbwheel background?		X			1	white on black
Is the height-to-stroke width ratio approximately 10:1?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.2.1.3.6 VISIBILITY						
Does thumbwheel design permit viewing of inline digital readout from all operator positions?	X				1	
5.4.2.1.3.7 DIMENSIONS						
Do thumbwheel control dimensions conform to the criteria set forth in Figure 6, 1472, page 77?	X				1	
5.4.2.1.3.8 RESISTANCE						
Is control resistance elastic?	X				1	
Does resistance build up and then decrease as each detent is approached so that the control snaps into position without stopping between adjacent detents?	X				1	
5.4.2.1.3.9 SEPARATION						
Does separation between adjacent edges of thumbwheel controls conform to the criteria in Figure 6, 1472c and sufficient to preclude accidental activation of adjacent controls during normal setting?	X				1	
5.4.3 LINEAR CONTROLS						
5.4.3.1 DISCRETE LINEAR CONTROLS						
5.4.3.1.1 PUSH BUTTONS (FINGER OR HAND OPERATED)						
5.4.3.1.1.1 USE						
Are push button used when a control or an array of controls is needed for momentary contact or for activating a locking circuit, particularly in high-frequency-of-use situations?	X				1	student console switches

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.1.2 SHAPE						
Are push button surfaces concave (indented) so as to fit the finger?		X			1	not necessary
Does the surface provide a high degree of frictional resistance to prevent slipping?	X				1	
5.4.3.1.1.3 POSITIVE INDICATION						
Does control activation produce a positive indication of that activation (e.g., snap feel, audible click, or integral light)?	X				1	"click"
5.4.3.1.1.4 CHANNEL OR COVER GUARD						
Is a channel or cover guard used when it is imperative to prevent accidental activation of the controls?			X		—	
Do cover guards, in the open position, not interfere with operation of the protected device or adjacent controls?			X		—	
5.4.3.1.1.5 DIMENSIONS, RESISTANCE, DISPLACEMENT, AND SEPARATION						
Do push button dimensions, resistances, displacements, and separations confore to the criteria set forth in Figure 11, 1472c, page 88?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.4 TOGGLE SWITCH CONTROLS						
5.4.3.1.4.1 USE						
Are toggle switches used for functions which require two discrete positions or where space limitations are severe?		X			1	
5.4.3.1.4.2 ACCIDENTAL ACTIVATION						
When the prevention of accidental activation is of primary importance (i.e., critical, dangerous, or hazardous conditions would result) are channel guards, lift-to-unlock switches, or other equivalent prevention mechanisms provided?			X		—	
Is safety or lock wire not used?			X		—	
If a cover guard is used, does its location interfere with the operation of the protected device or adjacent controls?			X		—	
5.4.3.1.4.3 DIMENSIONS, RESISTANCE DISPLACEMENT, AND SEPARATION						
Do dimensions, resistances, displacements, and separations between adjacent edges of toggle switches conform to the criteria set forth in Figure 13, 1472c, page 93?			X		—	
Can toggle switches be stopped only at numerical positions?			X		—	
5.4.3.1.4.4 POSITIVE INDICATION						
Is an indication of control activation provided (e.g., snap feel, audible click, associated or integral light)?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.4.5 ORIENTATION						
Are toggle switches vertically oriented with OFF in the down position?			X		—	
Is horizontal orientation and actuation used only for compatibility with the controlled function or equipment location?			X		—	
5.4.3.1.6 ROCKER SWITCHES						
5.4.3.1.6.1 USE						
Are rocker switches used in lieu of toggle switches for functions which require two discrete positions?		X			1	
Are rocker switches used where toggle switch handle protrusions might snag the operator's sleeve or phone cord, or where there is insufficient panel space for separate labeling of switch positions?		X			1	
5.4.3.1.6.2 ACCIDENTAL ACTIVATION						
Are channel guards or equivalent protective measures used when the prevention of accidental activation is of primary importance (e.g., critical, dangerous or hazardous conditions would result)?			X		—	
5.4.3.1.6.3 POSITIVE INDICATION						
Is an indication of control activation provided (e.g., snap feel, audible click, associated or integral light)?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.4.3.1.6.4 DIMENSIONS, RESISTANCE DISPLACEMENT, AND SEPARATION						
Do dimensions, resistances, displacements, and separations between centers of rocker switches conform to the criteria in Figure 15, 1472c, page 96?			X		—	
Does resistance gradually increase, and then drop when the switch snaps into position?			X		—	
Can the switch be stopped only at the required positions?			X		—	
5.4.3.1.6.6 ORIENTATION						
Where practicable, are rocker switches mounted vertically?			X		—	
Does activation of the upper wing turn the equipment or component on?			X		—	
Is horizonal orientation of rocker switches used only for compatibility with the controlled function or equipment location?			X		—	
5.4.3.1.6.7 COLOR AND ILLUMINATION						
Are alternate colors used to denote the ON and OFF positions of a rocker switch?			X		—	
Is alternate illumination of either the ON or OFF positions used to facilitate positive recognition of current switch position?			X		—	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA LABELING SECTION 5.5 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM _____ COMPONENT _____

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.5 LABELING						
5.5.1 GENERAL						
5.5.1.1 APPLICATION						
Are labels, legends, placards, signs, or markings provided where personnel must identify, interpret, or follow procedures or avoid hazards?	X				2	
5.5.1.2 LABEL CHARACTERISTICS						
Are labels:						
accurate in their information?	X				2	
consistent with time available for recognition or other responses?	X				1	
readable at reasonable distance?	X				1	
properly illuminated and colored?	X				1	
consistent with criticality of function labeled?	X				1	
consistent within and between system components and subsystems?	X				1	
5.5.1.3 PROTOTYPE AND PRODUCTION EQUIPMENT LABELS						
Are labels on prototype easily and simply affixed so that they can be altered, and removed if design changes occur?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.5.2 ORIENTATION AND LOCATION						
5.5.2.1 ORIENTATION						
Are labels and information on them oriented horizonally so that they can be read quickly and easily form left to right?	X				2	
5.5.2.2 LOCATION						
Are labels placed on or very near the items which they identify?	X				2	
Are labels placed so no other information is hidden?		X			1	
Are labels placed so controls do not obscure label information?	X				1	
5.5.2.3 STANDARDIZATION						
Are labels located in a consistent manner thoughout the equipment and system?	X				2	
5.5.3 CONTENTS						
5.5.3.1 EQUIPMENT FUNCTIONS						
Do labels primarily describe the functions of equipment items?	X				2	
5.5.3.2 ABBREVIATIONS						
Are abbreviations used on labels?		X			1	
If abbreviations are used, do they conform to military standards?			X		—	
5.5.3.3 IRRELEVANT INFORMATION						
Does only relevant information appear on labels or placards?		X			1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.5.4 QUALITIES						
5.5.4.1 BREVITY						
Are labels consise as possible without sacrificing intended meaning or information?	X				2	
Are labels or placards unambiguous?	X				2	
5.5.4.2 FAMILIARITY						
Do words on labels or placards use familiar words or language?	X				2	
Are common terms used which will be understood by those who will operate the equipment?	X				2	
5.5.4.3 VISIBILITY AND LEGIBILITY						
Can labels and placards be read easily and accurately at operational distances?	X				2	
5.5.4.4 ACCESS						
Are labels placed so that they are not obscured or covered by other equipment or assemblies?	X				2	
5.5.4.5 LABEL LIFE						
Are labels clear and distinct?	X				1	
Do they have high contrast?	X				1	
Are they resistant to grease, grime, dirt, etc.?	X				1	
5.5.4.6 LABEL BACKGROUND						
Does label color contrast with the equipment background specified in 5.7.9?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.5.5.4 CAPITAL VS LOWER CASE						
5.5.5.4.1 LABELS						
Are labels printed in all capitals?	X				1	
5.5.6 EQUIPMENT LABELING						
5.5.6.1 UNITS, ASSEMBLIES, SUB-ASSEMBLIES AND PARTS						
5.5.6.1.1 GENERAL REQUIREMENTS						
Are units, assemblies, sub-assemblies and parts labeled with a clearly visible, legible, and meaningful name, number, code, mark or symbol, as applicable?	X				1	generally, yes
5.5.6.1.2 LOCATION						
Are gross identifying labels on a unit, assembly or major subassembly located:						
so that they are not obscured by adjacent items?	X				1	
on the flattest, most uncluttered surface available?	X				1	
in a way so as to minimize wear or obscurement by grease, grime, etc.?	X				1	
in a way to preclude accidental removal, obstruction, or damage?		X			1	
5.5.6.2 CONTROLS AND DISPLAYS						
5.5.6.2.1 GENERAL REQUIREMENTS						
Are controls and displays appropriately and clearly labeled with enough information for proper identification, utilization, actuation, or manipulation of the element?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.5.6.2.2 SIMPLICITY						
Do control and display labels convey verbal meaning in a direct and unambiguous manner?	X				2	
Do they use simple words and phrases?	X				1	
5.5.6.2.3 FUNCTIONAL LABELING						
Are controls and displays labeled according to their function, according to the following criteria:						
are dissimilar names used for different controls and displays?	X				2	
are instruments labeled in terms of what is being measured or controlled, and in terms of the purpose and use by the operator?	X				2	
does control labeling indicate functional result of a control movement?		X			2	
when applicable, are appropriate labels used to indicate the functional relationships between controls and displays?			X		—	
5.5.6.2.4 LOCATION						
When applicable, do control and display labels meet the following criteria:						
is ease of control operation given priority over visibility of control position labels?	X				1	
are labels placed over the controls and displays they describe?	X				1	
are labels used to identify functionally grouped controls and displays?	X				1	
is label location unifera throughout the system and subsystems unifera?	X				1	

HUMAN FACTORS ANALYSIS
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AREA WORKSPACE DESIGN REQUIREMENTS SECTION 5.7 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM _____ COMPONENT _____

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.7 WORKSPACE DESIGN REQUIREMENTS						
5.7.1 GENERAL						
5.7.1.1 KICK SPACE						
Are cabinets, consoles, and work surfaces that require an operator to stand or sit close to their front surface provided with a kick space at the base at least 100 mm (4 in.) deep and 100 mm (4 in.) high?	X				1	3-D modules, instructor, student consoles
5.7.2 STANDING OPERATIONS						
5.7.2.1 WORK SURFACE						
Are work surfaces which must support job instruction manuals, worksheets, etc. 915 +/-15 mm (36 +/-.6 in.) above the floor?	X				1	diesel, radar
5.7.2.2 DISPLAY PLACEMENT, NORMAL						
Are visual displays mounted on vertical panels and used in normal equipment operations placed between 1.040 m (41 in.) and 1.780 m (70 in.) above the standing surface?	X				1	
5.7.2.3 DISPLAY PLACEMENT, SPECIAL						
Are displays requiring precise and frequent reading placed between 1.270 m (50 in.) and 1.650 m (65 in.) above the standing surface?	X				1	
5.7.2.4 CONTROL PLACEMENT, NORMAL						
Are controls mounted on vertical surfaces and used in normal equipment operations located between 860 mm and 1.780 m (34 and 70 in.) above the standing surface?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.7.2.5 CONTROL PLACEMENT, SPECIAL						
Are controls requiring precise or frequent operation and emergency controls mounted between 860mm and 1.350 m (34 and 53 in.) above the standing surface and no farther than 530 mm (21 in.) laterally from the centerline?	X				1	
5.7.3 SEATED OPERATIONS						
5.7.3.1 WORK SURFACE WIDTH						
Has a lateral workspace of at least 760 mm (30 in.) wide and 400 mm (16 in.) deep been provided?	X				1	
5.7.3.2 WORK SURFACE HEIGHT						
Are desk tops and writing tables between 740 and 790 mm (29 to 31 in.) above the floor?	X				1	
5.7.3.3 WRITING SURFACES						
Where a writing surface is required on equipment consoles, is that surface at least 400 mm (16 in.) deep and 610 mm (24 in.) wide?	X				1	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA MAINTAINABILITY SECTION 5.9 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM _____ COMPONENT _____

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9 DESIGN FOR MAINTAINABILITY						
5.9.1 GENERAL						
5.9.1.1 STANDARDIZATION						
Is equipment designed to incorporate standard parts to the maximum extent possible?	X				2	
5.9.1.2 SPECIAL TOOLS						
Are special tools required for operation adjustment securely mounted within the equipment in a readily accessible location?			X		—	
5.9.1.3 MODULAR REPLACEMENT						
Is equipment designed and constructed for replacement of modular packages?		X			1	generally not, with the exception of computer boards, hard disk, CRT, slide projector
Is rapid and easy removal and replacement of modular packages provided wherever possible?	X				1	where possible
5.9.1.4 GROUPING OF FUNCTIONS						
Is the number of inputs to and outputs from each unit kept to a minimum by grouping functions so as to minimize criss-crossing of signals?	X				1	
5.9.1.5 SEPARATE ADJUSTABILITY						
Are functions so unitized that it will be possible to check and adjust each item separately, except where this would be inconsistent with established maintenance concepts?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.1.6 MALFUNCTION IDENTIFICATION						
Does equipment design facilitate rapid and positive fault detection and isolation of defective items to permit their prompt removal and replacement?				X	—	though doubtful
5.9.1.7 ASSEMBLY AND DISASSEMBLY						
Does equipment design facilitate assembly and disassembly?		X			2	
5.9.1.9 FOOLPROOF DESIGN						
Have provisions been made to preclude improper mounting and installation of parts?				X	—	
Have the following provisions been accomplished:						
a. Physical measures to preclude interchange of units or components of a same or similar form that are not in fact functionally interchangeable?				X	—	
b. Physical measures to preclude improper mounting of units or components?				X	—	
c. Measure (e.g., coding) to facilitate identification and interchange of interchangeable units or components?				X	—	
d. Measures (e.g., alignment pins) to facilitate proper mounting of units and components?	X				1	
e. Measures to insure that identification, orientation, and alignment provisions include cables and connectors?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.2 MOUNTING OF ITEMS WITHIN UNITS						
5.9.2.1 USE OF TWO-DIMENSIONAL SURFACE						
Are parts mounted in an orderly array on a "two-dimensional" surface rather than "stacked" one on another (i.e., a lower layer should not support an upper layer)?				X	—	
5.9.2.2 SIMILARITY						
Are items of the same or similar form, but different functional properties, mounted with a standard orientation throughout the unit?	X				1	computer boards for example
Are these items readily identifiable and distinguishable, and not physically interchangeable?	X				1	
5.9.2.3 DELICATE ITEMS						
Are delicate items located or guarded so that they will not be susceptible to damage while the unit is being handled or maintained?		X			2	
5.9.3 ADJUSTMENT CONTROLS						
5.9.3.1 GENERAL				X	—	
Are controls required for maintenance purposes in compliance with basic control design requirements in 5.4 and labeling requirements in 5.5?						
5.9.3.1.1 CALIBRATION ADJUSTMENTS				X	—	
Are knobs used in preference to screwdriver adjustments whenever frequent adjustment must be made?						

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.3.2 SCREWDRIVER ADJUSTMENTS						
If screwdriver adjustments must be made without the aid of vision, have mechanical guides for the screwdriver shaft been provided or the screws mounted so that the screwdriver will not move out of position?				X	—	
5.9.3.3 REFERENCE SCALE FOR ADJUSTMENT CONTROLS						
ADJUSTMENT CONTROLS						
Has a reference scale been provided to offer appropriate feedback for all adjustment controls?				X	—	
5.9.3.4 CONTROL LIMITS						
Have calibration or adjustment controls which are intended to have a limited degree of motion been provided with adequate mechanical stops to prevent damage?				X	—	
5.9.3.5 SENSITIVE ADJUSTMENTS						
Are sensitive adjustment points located or guarded so that adjustmens will not be disturbed inadvertently?				X	—	
5.9.3.6 HAZARDOUS LOCATIONS						
Are internal controls located away from dangerous voltages, rotating machinery, or any other hazards?				X	—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.4 ACCESSIBILITY						
5.9.4.1 STRUCTURAL MEMBERS						
Are structural members of units or chassis parts located so as not to prevent access to or removal of items?	X				1	for most part, yes, but some components are difficult to get at
Are replaceable items mounted in a manner which will make them easy to remove?	X				1	backplane arrangement difficult to service
Where accessibility depends upon removal of panels, cases, and covers, have measures been taken to insure that such items are not blocked by structural members or other items?	X				1	see 5.9.4.1
5.9.4.2 LARGE ITEMS						
Are large items which are difficult to remove mounted so that they will allow convenient access to other items?	X				1	
5.9.4.3 USE OF TOOLS AND TEST EQUIPMENT						
Are check points, adjustment points, test points, cables, connectors, and labels accessible and visible during maintenance?	X				1	for most part
Has sufficient space been provided for the use of test equipment and other required tools without difficulty or hazard?				X	—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.4.4 REAR ACCESS						
Is sliding, rotating or hinged equipment to which rear access is required free to open or rotate fully and remain in an open position without being supported by hand?		X			1	not always, 2-D/3-D hookup panel on diesel, for example
Has rear access also been provided to plug connectors except where precluded by any other operational requirements?	X				1	
5.9.4.5 RELATIVE ACCESSIBILITY						
Have items most critical to system operation and which require rapid maintenance been made most accessible?				X	—	though doubtful, in case of computer components
5.9.4.6 HIGH-FAILURE-RATE ITEMS						
Are high-failure-rate items accessible for replacement without moving non-failed parts?				X	—	
Are these replacement items removable with common hand tools and simple handling equipment?				X	—	
5.9.4.7 SKILLS						
Does access to items maintained by one technician allow critical equipment maintained by another technician to remain in place?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.9 ACCESS OPENINGS AND COVERS						
5.9.9.1 APPLICATION						
Has an access been provided whenever frequent maintenance operations require removing a case or covering, opening a fitting, or dismantling an item of equipment?	X				1	
5.9.9.2 SELF-SUPPORTING COVERS						
Are access covers that are not completely removable, self-supporting?	X				1	except for 5.9.4.4
Are accesses (and covers) devoid of sharp edges to preclude hand injury and clothing damage?	X				1	
5.9.9.3 LABELING						
Are accesses labeled with nomenclature for items visible or accessible through it?			X		—	
Are accesses labeled with warning signs, advising of any hazards esisting beyond the access and stating necessary precaution?			X		—	
Are warning notices clear, direct, and attention-getting?			X		—	
5.9.13 CONDUCTORS						
5.9.13.1 CODING						
Are cables containing individually insulated conductors with a common sheath, coded?	X				1	
5.9.13.2 CABLE CLAMPS						
Are long conductors, bundles, or cables, internal to equipment, secured to the equipment chassis by means of clamps unless contained in wiring ducts or cable retractors?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.13.3 LENGTH						
Are cables long enough so that each functioning unit can be checked in a convenient place?	X				1	generally, yes, although longer 3-D cables might be desirable in some cases
5.9.13.4 LOCATION OF TEST CABLES						
If test cables must terminate on control and display panels, are test receptacles located so that the test cables will not interfere with controls and displays?			X		—	
5.9.13.5 ACCESS						
Are cables routed so as to be readily accessible for inspection and repair?	X				1	generally true
5.9.13.6 SUSCEPTABILITY TO ABUSE						
Are cables routed or protected in such a way that they may not be pinched by doors, lids, etc., walked on, used for hand holds, or bent or twisted sharply or repeatedly?		X			2	not always; 3-D cables, student station cables, etc. are subject to potential damage from persons walking behind units, etc.
5.9.13.7 CABLE PROTECTION						
If cables and wires are routed through holes in metal partitions, are the conductors protected from mechanical damage or wear by grommets or equivalent means?	X				1	
5.9.13.8 IDENTIFICATION						
Are cables labeled to indicate the equipment to which they belong and the connectors with which they mate?	X				1	most cases; some exceptions (e.g., computer wiring)

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.14 CONNECTORS						
5.9.14.1 USE OF QUICK DISCONNECT PLUGS						
Are plugs which require no more than one turn, or other quick-disconnect plugs, used whenever possible?	X				1	
5.9.14.2 KEYING						
Are plugs designed so that it is impossible to insert the wrong plug into a receptacle?			X		—	
5.9.14.3 IDENTIFICATION						
Does marking of electrical connectors confora to REQUIREMENT 67 of MIL-STD-454?				X	—	
Are electrical plugs and receptacles also identified by color, shape or equivalent means?			X		—	
5.9.14.4 ALIGNMENT						
Are plugs or receptacles provided with aligning pins or equivalent devices to aid in alignment and to preclude inserting in other than the desired position?	X				1	
5.9.14.5 ALIGNMENT PINS						
Do alignment pins extend beyond the plug's electrical pins to insure that alignment is obtained before electrical pins engage?	X				1	
5.9.14.6 ORIENTATION						
Are plugs and receptacles arranged so that the aligning pins or equivalent devices are oriented in the same relative position?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.9.14.7 CODING						
Are plugs and receptacles provided with durable strips, arrows, or other indications to show the positions of aligning pins or equivalent devices for proper insertion?	X				1	
5.9.17 FAILURE INDICATIONS AND FUSE REQUIREMENTS						
5.9.17.1 INDICATION OF EQUIPMENT FAILURE						
5.9.17.1.1 POWER FAILURE						
Is an indication provided to reveal when power failure occurs?		X			1	
5.9.17.1.3 CRITICAL MALFUNCTIONS						
If equipment is not regularly monitored, and if the equipment fails, is an auditory alarm provided to indicate critical malfunctions?		X			1	

HUMAN FACTORS ANALYSIS
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AREA HAZARDS & SAFETY SECTION 5.13 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM _____ COMPONENT _____

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.13 HAZARDS AND SAFETY 5.13.1 GENERAL						
Are safety factors given a major consideration in the overall design?	X				2	Generally, yes
5.13.2 SAFETY LABELS AND PLACARDS						
5.13.2.1 WARNING PLACARDS						
Are conspicuous placards mounted adjacent to any equipment which represents a hazard to personnel?	X				1	
5.13.2.6 ELECTRICAL LABELS						
Are all receptacles marked with their voltage, phase, and frequency characteristics, as appropriate?		X			1	desirable, but not essential
5.13.5 GENERAL EQUIPMENT-RELATED HAZARDS						
5.13.5.2 ACCESS						
Are units located and mounted so that access to them can be achieved without danger to personnel from electrical charge, heat, moving parts, chemical contamination, radiation, or other hazards?	X				1	
5.13.5.4 EDGE ROUNDING						
Where applicable, are exposed edges and corners rounded to a minimum of .75 mm (.03 in) radius?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.13.7. ELECTRICAL, MECHANICAL, FLUID TOXIC AND RADIATION HAZARDS						
5.13.7.1 ELECTRICAL HAZARDS						
5.13.7.1.1 INSULATION OF TOOLS						
Are tools and test leads to be used near high voltages adequately insulated?			X		—	
5.13.7.1.2 PLUGS AND RECEPTACLES						
Are plugs and receptqcles designed so that a plug of one voltage rating cannot be inserted into a receptacle of another rating?	X				1	
5.13.7.1.4 HIGH VOLTAGES						
Are guards, grounding, interlocks, and warning placards provided so as to minimize the possibility of exposing personnel to dangerous voltages?	X				1	
5.13.7.1.7 ELECTRONIC EQUIPMENT						
Is electronic equipment designed in accordance with Requirement 1 of Mil-std-454?				X	—	

HUMAN FACTORS ANALYSIS
DESIGN CHECKLIST

AREA USER-COMPUTER INTERFACE SECTION 5.15 (MIL-STD-1472C)

SYSTEM SEVILLE/BURTEK SUBSYSTEM 2-D COMPONENT

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15 USER-COMPUTER INTERFACE 5.15.1 GENERAL						
Do computer programs and computer interfaces provide a functional interface between the system for which they were designed and users (operators/ maintainers) of the system?	X				4	
5.15.2 DATA ENTRY						
5.15.2.1 GENERAL						
5.15.2.1 USER PACING-MANUAL						
Is data entry paced by the user, depending on the user's application, criticality of operation and attention span, rather than by the system?	X				2	
5.15.2.2 POSITIVE FEEDBACK						
Does the system provide positive feedback to the user about the acceptance or rejection of a data entry?	X				2	
5.15.2.3 PROCESSING DELAY						
Where system overload or other system conditions will result in a processing delay, does the sytem acknowledge the data entry and provide an indication of the delay to the user?	X				1	
5.15.2.4 EXPLICIT ACTION						
Does data entry require an explicit completion actions, such as depression of an ENTRY or RETURN key?	X				2	both on instrcutor/student consoles and with keyboarc entries by instructor

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.2.5 VALIDATION						
Are data entries validated by the sytem for correct format, legal value, or range of values?	X				2	
5.15.2.6 SOFTWARE-AVAILABLE DATA						
Is the user not required to enter data already available to the software?	X				1	
5.15.2.7 INPUT UNITS						
Are data entered in units which are familiar to the user?	X				2	
5.15.2.1.8 CURSORS						
5.15.2.1.8.1 CONTROL						
Does the system employ a cursor which provides cursor control capability consistent with user speed and accuracy requirements?	X				1	
5.15,2.1.8.2 DISPLAY						
Do movable cursors within a display have distinctive visual attributes which do not obscure other displayed entities?	X				1	
5.15.2.1.8.3 HOME POSITION						
Is the home position of the cursor consistent across similar types of displays?	X				1	
5.15.2.1.8.10 ABBREVIATIONS, MNEMONICS, AND CODES						
When abbreviations, mnemonics, or codes are used to shorten data entry, are they distinctive and have a relationship or association to normal language or specific job-related terminology?	X				1	generally

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.2.2 KEYBOARD						
5.15.2.2.1 USE						
Is a keyboard used to enter alphabetic, numeric and other special characters into the system?	X				1	instructor OPED program; keyboard not needed for student interactions
5.15.2.2.2 CONFIGURATION						
Does the keyboard conform to MIL-STD-1280, unless otherwise specified or approved by the procuring authority?	X				1	
5.15.2.2.3 TIMELY DISPLAY						
Are keyed inputs, except security items such as passwords, echoed on the display within 0.1 sec?	X				1	generally
5.15.2.2.4 LENGTH						
Is the length of individual data items reasonable?	X				1	
5.15.2.2.5 JUSTIFICATION						
Is the user not required to justify tabular data?	X				1	
5.15.2.2.6 NUMERIC KEYBOARDS						
Is a numeric keyboard provided?	X				1	
5.15.2.2.7 MINIMIZATION OF KEYING						
Is the amount of keying necessary by the user minimized?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.2.3 FIXED FUNCTION (DEDICATED) KEYS						
5.15.2.3.1 USE						
Are fixed function keys used for time-critical, error-critical or frequently used control inputs?	X				2	Instructor/student consoles
5.15.2.3.2 STANDARDIZATION						
Are fixed function keys common throughout the system?	X				2	
5.15.2.3.3 FUNCTIONAL CONSISTENCY						
Are fixed-function keys always assigned to perform the same function all the time?	X				1	
5.15.2.3.4 AVAILABILITY						
Are fixed function keys selected to control functions that are continuously available?	X				2	
Are lockouts of fixed function keys minimized?	X				2	
5.15.2.3.5 NON-ACTIVE KEYS						
Are non-active fixed function keys blanked out on the keyboard?			X		—	
5.15.2.3.6 GROUPING						
Are fixed function keys logically grouped and placed in a distinctive location on the keyboard?	X				2	
5.15.2.3.7 ACTIVATION						
Do fixed function keys require only a single keystroke?	X				2	
5.15.2.3.8 FEEDBACK						
Does activation of a fixed function key give the user system acknowledgement?	X				2	
5.15.2.3.9 FUNCTION LABELS						
Are key assignments displayed at all time, preferably through direct marking?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.2.4 VARIABLE FUNCTION KEYS						
5.15.2.4.1 USE						
Are variable function keys used for programmable menu selection and entry of control functions?			X		—	
5.15.2.4.2 STATUS DISPLAY						
When the effect of a function key changes, is the status of the key displayed to the user?			X		—	
5.15.2.4.3 REPROGRAMMABLE OR INACTIVE DEFAULT FUNCTIONS						
Is the user warned visually when a standard function is not currently available?			X		—	
5.15.2.4.4 RELABELING						
Has provision been made for easily relabeling variable function keys?			X		—	
5.15.2.4.5 SHIFTED CHARACTERS						
Are variable function keys not activated by depressing the shift key along with a character key?			X		—	
5.15.3 DATA DISPLAY						
5.15.3.1 DISPLAY FORMAT						
5.15.3.1.1 CONSISTENCY						
Are display formats consistent within a system?	X				1	
a. When appropriate for users, is the same format used for input and output?	X				1	
b. Do data entry formats match the source document formats?	X				1	
c. Are essential data, text, and formats under computer, not user control?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.1.2 CRITICALITY						
Are data that are essential the only kinds of data that are displayed to the user?	X				2	
5.15.3.1.3 READILY USABLE FORM						
Are data displayed to the user in a readily usable and readable form?	X				2	
5.15.3.1.4 ORDER AND SEQUENCES						
When data fields have a n naturally occurring order (e.g., chronological), is the order reflected in the format organization of the fields?	X				1	
5.15.3.1.5 DATA SEPARATION						
Is separation of groups of information accomplished by blanks, spacing, lines, color coding, or or other means consistent with the application?	X				1	
5.15.3.1.6 RECURRING DATA FIELDS						
Do recurring data fields within a system have consistent names and have consistent relative position within displays?	X				1	
5.15.3.1.7 EXTENDED ALPHANUMERICS ERICS						
When five or more alphanumerics without natural organization are displayed, are they grouped in blocks of three to five characters within each group separated by a minimum of one blank space or other separating character?				X	—	
5.15.3.1.8 COMPARATIVE DATA FIELDS						
With data fields that are to be compared on a character-by-character basis, are characters positioned one above another?	X				1	
5.15.3.1.9 LABELS AND TITLES						
Is each display labeled with a title or label that is unique within the system?	X				1	
Are fields and column headings labeled?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.1.10 DATA GROUP LABELS						
Do individual data groups or messages contain a descriptive title, phrase, word or similiar device to designate the content of the group or message?	X				1	
Are labels:						
a. located in a consistent fashion adjacent to the data group or message they describe?	X				1	
b. highlighted or otherwise accentuated to facilitate operator scanning and recognition?			X		—	
c. unique and meaningful to distinguish them from data, error messages, or other alpha-numerics?	X				1	
d. displayed in upper case only? (text may be displayed in upper and lower case)	X				1	
e. reflective of the question or decision being posed to the user when presenting a list of options?	X				1	in most cases
5.15.3.1.11 SCROLLING						
Are items which are continued on the next page, numbered relative to the last item on the previous page?	X				1	
5.15.3.1.12 PAGE NUMBERING						
Is each page of a multiple page display labeled to identify the currently displayed page and total number of pages?				X	—	
5.15.3.1.13 FRAME IDENTIFICATION						
Does every display frame have a unique identification to provide a reference for use in requesting the display of that frame?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.2 DISPLAY CONTENT						
5.15.3.2.1 STANDARDIZATION						
Is the content of displays within the system presented in a consistent, standardized manner?	X				2	
5.15.3.2.2 INFORMATION DENSITY						
Is information density held to a minimum in displays used for critical task sequences?	X				2	
5.15.3.2.3 ABBREVIATIONS AND ACRONYMS						
Is information displayed in plain concise text wherever possible?	X				2	
Do abbreviations and acronyms conform to MIL-STD-12, MIL-STD-411, or MIL-STD-783?				X	—	
Are abbreviations distinctive to avoid confusion?	X				2	
Do words have only one distinctive abbreviation?	X				2	
Is punctuation used in abbreviations?				X	—	
Have defintions of all abbreviations, mnemonics and codes been provided at the user's request?	X				2	available in documentation for system
5.15.3.3 DISPLAY CODING						
5.15.3.3.1 USE						
Is coding employed to differentiate between items of information and to call the user's attention to changes in the state of the system?	X				2	
Is coding used for critical information, unusual values, changed items, items to be changed, high priority messages, special areas of the display, errors in entry, criticality of command entry, and targets.	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
Does coding not interfere with legibility or transmission time?	X				2	
5.15.3.3.2 FLASH						
Is flash coding used to call the user's attention to mission critical events only?			X		—	
Are not more than 2 flash rates used?			X		—	
Where one rate is used, is the rate between 3 and 5 flashes per second?			X		—	
Where two rates are used, is the second rate less than 2 per second?			X		—	
5.15.3.3.3 BRIGHTNESS						
Is brightness intensity coding used only to differentiate between an item of informion and adjacent information?			X		—	
Are not more than three levels of brightness used?			X		—	
Is each brightness level separated from the nearest by at least a 2:1 ratio?			X		—	
5.15.3.3.4 PATTERN						
Is pattern and location coding used to reduce user search time by restricting the area to be searched to prescribed segments?			X		—	
5.15.3.3.5 UNDERLINING						
Is underlining used to indicate unusual values, errors in entry, changed items or items to be changed?		X			1	
5.15.3.3.6 SYMBOL						
Is symbol coding used to enhance information assimilation from data displays?	X				2	
Are symbols analogs of the event or system element they represent or in general use and well-known to the user?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
Where size differences between symbols is employed, are the major dimensions of the larger at least 150% of the major dimension of the smaller with a maximum of three size levels permitted?			X		—	
5.15.3.3.7 COLOR						
Is color coding used to differentiate between classes of information in complex, dense, or critical displays?			X		—	
Are colors used not in conflict with the color associations specified in TABLE II?			X		—	
5.15.3.5 TABULAR DATA						
5.15.3.5.1 USE						
Are tabular data displays used to present row-column data?	X				1	
5.15.3.5.2 STANDARD FORMATS						
Is the location of recurring data similar among all tabular data displayed and common throughout the system?	X				1	
5.15.3.5.3 ARRANGEMENT						
Is tabular data displayed in a left-to-right, top-to-bottom array?	X				1	
Is alphanumeric data left-justified?	X				1	
Is numeric data right-justified with decimal points, if any, aligned vertically?	X				1	
5.15.3.5.4 TITLES						
When tabular data are divided into classifications, are classification titles displayed and subclassifications identified?	X				1	
If tabular data extend over more than one page vertically, are columns titled identically on each page?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.5.5 HORIZONTAL EXTENSION						
Do tabular displays remain on the one page & not extend over more than one page horizontally?	X				1	
5.15.3.5.6 LISTS						
Are items in lists arranged in a recognizable order, such as chronological, alphabetical, sequential, functional, or importance?	X				2	
5.15.3.5.6.1 LIST LINES						
Is each item in a list on a new line?	X				1	
5.15.3.5.6.2 VERTICAL EXTENSION						
Where lists extend over more than one display page, is the last line of one page the first line of the succeeding page?				X	—	
5.15.3.5.7 NUMERIC PUNCTUATION						
Are long numeric fields punctuated with spaces, commas, or slashes?				X	—	
Are conventional punctuation schemes used?	X				1	
5.15.3.5.8 ALPHANUMERIC GROUPING						
Are strings of alphanumerics grouped into sets of three to five characters or grouped at natural breaks?				X	—	
When a code consists of both letters and digits, are common character types grouped by common character type for ease of location?				X	—	
5.15.3.7 TEXTUAL DATA DISPLAYS						
5.15.3.7.1 USE						
Is information, such as abstracts or reports, presented in text format?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.7.2 FORMATS						
Do textual data formats conform to the practices established for the particular type of textual data displayed? (see MIL-STD-490)				X	—	
5.15.3.7.3 PARAGRAPH SEPARATION						
Are text paragraphs separated by a least one blank line?	X				1	
Are paragraphs numbered?			X		—	
5.15.3.7.4 BREVITY						
Are short, simple sentences used?	X				2	
5.15.3.7.5 CASE						
Is text displayed in both upper/lower case?	X				1	
5.15.3.7.6 ABBREVIATIONS						
Is information displayed in plain concise text where possible?	X				2	
Are abbreviations distinctive to avoid confusion?	X				2	
Do words have only one distinctive abbreviation?	X				2	
Is punctuation not used in abbreviations?				X	—	
Have definitions of all abbreviations, mnemonics and codes been provided?	X				2	available in system documentation
5.15.3.8 TEXT/PROGRAM EDITING						
5.15.3.8.1 BUFFER						
When inserting characters, words, or phrases (e.g., editing) are items to be inserted collected in a buffer area and displayed in the prescribed insert area of the screen for subsequent insertion by the user's command?	X				1	
5.15.3.8.2 PRESENTATION MODE						
Is display mode used for text editing?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.8.3 DISPLAY WINDOW						
Do ROLL and SCROLL commands refer to the display window, not the text/data, that is, does the display window appear to the user to be an aperture moving over stationary text?	X				1	
5.15.3.8.4.1 EDITING COMMANDS						
Are special text-editing commands based on sentences, paragraphs, or higher-order segments?			X		—	
5.15.3.8.4.2 PROGRAM EDIT COMMANDS						
In program editing, are special commands based on lines or subprograms?			X		—	
Do program lines reflect a numbering scheme for ease of editing and error correction?			X		—	
Is line-by-line syntax checking under user control?			X		—	
5.15.3.8.4.3 TAB CONTROLS						
Are cursor tab controls or other provision for establishing and moving readily from field to field provided?	X				1	
5.15.3.9 AUDIO DISPLAYS						
5.15.3.9.1 USES						
Are audio displays (signals) used as part of the user-computer interface?	X				2	
Are audio displays used:						
a. when the common mode of visual display is restricted or overburdened, or when user mobility needs demand a cue, alert or warning?	X				2	
b. when the user should be provided feedback after control actuation, data entry, or completion of timing cycles and sequences?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.3.9.3 SUPPORTIVE FUNCTION						
Are audio signals used to supplement visual displays to do such things as alert and direct the user's attention to appropriate visual display information?	X				2	instructor entry errors, instructor "call"
5.15.3.9.4 SIGNAL CHARACTERISTICS						
Is the intensity, duration, and source location of the audio signal compatible with the acoustical environment of the intended receiver as well as the requirements of other personnel in the signal area?	X				1	
Are such signals intermittent, allowing the user sufficient time to respond?			X		—	
5.15.4 INTERACTIVE CONTROL						
5.15.4.1 GENERAL						
Are system response times consistent with operational requirements?	X				2	
5.15.4.1.1 SIMPLICITY						
Are control/display relationships straightforward and explicit?	X				2	
Are control actions simple and direct?	X				2	
5.15.4.1.2 ACCIDENTAL ACTUATION						
Have provisions been made to prevent accidental actuation of potentially destructive control actions, including the possibility of accidental erasure or memory dump?	X				2	
5.15.4.1.3 COMPATIBILITY WITH USER SKILL						
Are controls compatible with the lowest anticipated user skill levels?	X				2	for general use of system; perhaps not for DEBUG program

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.4.1.4 AVAILABILITY OF INFORMATION						
Is the information necessary to select or enter a specific control action available to the user when selection of that control action is appropriate?	X				2	
5.15.4.1.5 CONCURRENT DISPLAY						
Do control actions to be selected from a discrete set of alternatives have those alternatives displayed prior to the time of selection?	X				1	in instructor OPED program
5.15.4.1.6 HIERARCHICAL PROCESS						
If hierarchical levels are used to control a process or sequence, is the number of levels minimized?	X				1	
5.15.4.1.7 USER MEMORIZATION						
Is the requirement to learn mnemonics, codes, special or long sequences, or special instructions minimized?	X				2	
5.15.4.1.8 DIALOGUE TYPE						
Is the dialogue for interactive control compatible with user characteristics and task requirements?	X				2	
5.15.4.1.9 NUMBER SYSTEM						
Is numeric data displayed or required for control input, in decimal, rather than binary, octal hexadecimal or other number systems?	X				2	
5.15.4.1.10 DATA MANIPULATION						
Can the user manipulate the data without concern for internal storage and retrieval mechanism within the system?	X				2	although data manipulation is limited
5.15.4.1.11 COMPUTER PROCESSING CONSTRAINTS						
Is the sequence of transaction selection generally dictated by the user's choices and not by internal computer processing constraints?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRI. CALITY	COMMENTS
5.15.4.1.12 FEEDBACK FOR CORRECT INPUT						
Does the system acknowledge the user only in those cases where the more conventional mechnanism is not appropriate or where feedback response time must not exceed one second?	X				2	
5.15.4.1.13 FEEDBACK FOR ERRONEOUS INPUT						
When control input errors are detected by the system, are error messages available as provided in 5.15.7.5, and error recovery procedures provided as in 5.15.7.8?	X				2	
5.15.4.1.14 CONTROL INPUT DATA DISPLAY						
Is the presence and location of control input data entered by the user clearly and appropriately indicated?	X				2	
5.15.4.2 MENU SELECTION						
5.15.4.2.1 USE						
Is menu selection interactive control used for tasks that involve little or no entry of arbitrary data or where users may have relatively little training?	X				1	OPED program
5.15.4.2.2 SELECTION DEVICES						
Are lightpens or other pointing devices used for menu selection?			X		—	
5.15.4.2.3 ACTIVE OPTION PRESENTATION						
Does the system only present menu selection for actions which are currently available?	X				1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.4.2.4 FORMAT CONSISTENCY						
Are menus presented in a consistent format throughout the system and readily available at all times?	X				1	
5.15.4.2.5 OPTION SEQUENCE						
Are menu selections listed in a logical order, or in the order of frequency of need?				X	—	
5.15.4.2.6 SIMPLE MENUS						
When the number of selections can fit on one page in no more than two columns, is a simple menu used?	X				1	
5.15.4.2.7 OPTION PRESENTATION						
Are selection codes and associated descriptors presented on a single line?	X				1	
5.15.4.2.8 DIRECT FUNCTION CALL						
If several levels of hierarchical menus are used, is a direct function call capability provided so that the experienced user does not have to step through multiple menu levels?				X	—	
5.15.4.2.9 CONSISTENCY WITH COMMAND LANGUAGE						
When menu selection is employed to train in the use of a command language, is the wording and order consistent with the command language?			X		—	
5.15.4.2.10 OPTION CODING						
When selections are indicated by coded entry, is the code associated with each option included on the display in some consistent manner?	X				1	
5.15.4.2.11 KEYED CODES						
If menu selections are made by keyed codes, are the options coded by the first several letters of their displayed labels rather than by more arbitrary numeric codes?		X			1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.4.5 COMMAND LANGUAGE						
5.15.4.5.1 USE						
Is command language interactive control used for tasks involving a wide range of user inputs or where user familiarity with the system can take advantage of the flexibility and speed of the control?	X				1	
5.15.4.5.2 USER VIEWPOINT						
Does the command language reflect the user's point of view such that the commands are logically related to the user's conception of what is being done?	X				1	
5.15.4.5.3 DISTINCTIVENESS						
Are commands distinctive from one another?	X				1	
5.15.4.5.4 PUNCTUATION						
Is a minimum of punctuation or other special characters used in the command language?			X		—	
5.15.4.5.5 ABBREVIATIONS						
Is the user permitted to enter the full command name or abbreviation for any command of more than five characters?			X		—	
5.15.4.5.6 STANDARDIZATION						
Are commands and their abbreviations, if any, standardized and consistent with MIL-STD-411 or MIL-STD 783?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.4.5.7 DISPLAYED LOCATION Are commands entered and displayed in a standard location on the display?	X				1	
5.15.4.5.8 COMMAND PROMPTS Can the user requst prompts, as necessary, to determine required parameters in a command entry?				X	—	
5.15.4.6 SOFTWARE						
5.15.4.6.1 GENERAL Do computer programs provide adequate information and respond within required time limits with sufficient detail and precision to assure mission accomplishment while minimizing stress on the user?	X				3	
5.15.4.6.2 INFORMATION AND SYSTEM RESPONSE Is information displayed to the user, such as symbols, display codes, prompts, alerts, and alarms limited to that which is necessary to perform specific actions or to make decisions?		X			2	
5.15.4.6.3 COMPUTER FAILURE When the computer fails, does the computer program allow for the orderly shutdown and establishment of a check-point so restoration can be accomplished without loss of computing performed to date?			X		2	much needed

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.4.6.4 TASK COMPLEXITY						
Does the software minimize user task complexity?	X				2	
Are control inputs simplified as much as possible?	X				2	
5.5.15.4.6.5 INTERACTION						
Where two or more users must have simultaneous read access to the computer program or data processing results from multiple personnel-equipment interfaces, do the actions of one person not interfere with the operations of another?			X		—	
—						
5.15.5 FEEDBACK						
5.15.5.1 USE						
Is feedback provided to the user as necessary to provide status information throughout the interaction?	X				2	
5.15.5.2 STAND-BY						
Is periodic feedback provided to the user to indicate normal system operation when the user is asked to stand-by?	X				2	e.g., "scanning for malfunctions"
5.15.5.3 PROCESS OUTCOME						
When a control process or sequence is completed or aborted by the system, is a positive indication presented to the user concerning the outcome of the process and the requirements for subsequent user action?	X				2	usually
5.15.5.4 INPUT CONFIRMATION						
Does confirmation of user input occur without removing the data display?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.5.5 CURRENT MODES						
When multiple modes of operation exist, is a means provided to remind the user of the current mode?	X				2	
5.15.5.6 HIGHLIGHTED OPTION SELECTION						
When a displayed message or datum is selected as an option or input to the system, is the subject item highlighted to indicate acknowledgement by the system?	X				1	
5.15.5.7 USER INPUT REJECTION						
If the system rejects a user input, is feedback provided to indicate the reason for rejection and the required corrective action?	X				2	
Is feedback under these circumstances self explanatory?				X	—	
5.15.6 PROMPTS						
5.15.6.1 USE						
Are prompts and help instructions used to explain commands, error messages, system capabilities, display formats, procedures, and sequences, and to provide data?	X				2	generally
5.15.6.2 STANDARD DISPLAY						
Are prompts displayed in a standardized area of displays?	X				1	
5.15.6.3 EXPLICIT PROMPTS						
Are prompts and help instructions for system-controlled dialogue explicit enough such that the user does not have to memorize lengthy sequences or refer to secondary written procedural references?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.6.4 PROMPT CLARITY						
Are prompts clear and understandable?	X				2	generally
Do they not require reference to coding schemes or conventions which may be unfamiliar to occasional users?	X				1	occasionally
5.15.6.5. DEFINITIONS						
Is a dictionary of abbreviations and codes available on-line?				X	—	
Are defintions of allowable options and ranges of values displayable at the user's request?				X	—	
5.15.6.6 CONSISTENT TERMINOLOGY						
Does on-line documentation, off-line documentation, and help instructions use consistent terminology?	X				2	
5.15.6.7 WORKLOAD REDUCTION						
Are default values used to reduce user workload?	X				1	
Are currently defined default values displayed automatically in their appropriate data fields with the initiation of a data entry transaction?	X				1	
Can the user indicate acceptance of a default?	X				1	
5.15.6.8 USER SELECTION						
Does the user have the option of generating default values based on operational experience if predefined appropriate values have not be accomplished?		X			1	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.6.9 DEFAULT SUBSTITUTION						
Can the user replace any default value during a given transaction without changing the default definition?	X				1	
5.15.6.10 USER CONFIRMATION						
Is user acceptance of stored data or defaults possible with a single confirming keystroke?	X				1	
5.15.7 ERROR MANAGEMENT/DATA PROTECTION						
5.15.7.1 ERROR CORRECTION						
Where users are required to make entries into a system, is an easy means available for correcting erroneous entries?	X				2	
Does the system permit correction of individual errors without requiring re-entry of correctly entered commands or data elements?				X	—	
5.15.7.2 EARLY DETECTION						
Is there a capability provided which facilitates detection and correction of errors before they are entered into the system?	X				2	
Does error checking occur at logical data entry breaks to avoid disrupting the user?	X				2	
5.15.7.3 INTERNAL SOFTWARE CHECKS						
Are user errors minimized by use of internal software checks of user entries for validity of item, sequence of entry, completeness of entry, or range of values?	X				2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.7.4 CRITICAL ENTRIES						
Does the system require the user to acknowledge critical entries prior to their being implemented by the system?	X				2	
5.15.7.5 PROMPTING AND STRUCTURING						
Does the system contain prompting and help instructions designed to request additional or corrected information to provide orientation to the user throughout all interactive sessions and when an error is detected?	X				2	
Does prompting conform to:						
a. when operating in special modes, does the system display the mode designation and files being processed?	X				1	
b. does the system require user confirmation before processing user requests which might result in extensive or final changes to existing data?	X				1	
c. when missing data are detected, does the system prompt the user?		X			2	
d. when data entries or changes will be nullified by an abort action, is the user requested to confirm the abort?	X				2	
e. when the user signals logoff, does the system check pending transactions to determine if data loss seems probable?				X	—	
if yes, does the computer prompt for confirmation before the logoff command is executed?				X	—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
4. do sign-on processes require a minimum input from the user consistent with requirements prohibiting illegal entry?	X				2	
5.15.7.6 ERROR MESSAGE CONTENT						
Are error messages constructive and neutral in tone, avoiding phrases that suggest a judgment of the user's behavior?	X				2	
Do error messages reflect the user's view, and not that of the programmer?	X				2	
Are error messages appropriate to the user's level of training and specific as possible to the user's particular application?	X				2	
5.15.7.7 ERROR RECOVERY AND PROCESS CHANGE						
Can the user stop the control process at any point in the sequence as a result of indicated error or as an option?				X	—	
Can the user return easily to previous levels in multi-step processes in order to nullify an error or to effect a desired change?				X	—	
5.15.7.8 DIAGNOSTIC INFORMATION						
Do error messages explicitly provide as much diagnostic information and remedial direction as can be inferred reliably from the error condition?		X			2	usually
Where inference is not possible, are helpful inference(s) provided?			X		2	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.7.9 CORRECTION ENTRY AND CONFIRMATION						
When a user enters a correction of an error, are such corrections implemented by an explicit action by the user (e.g., actuation of an ENTER key)?	X				2	
Are all error corrrections by the user acknowledged by the system either by indicating a correct entry has been made or by another error message?	X				2	
5.15.7.10 SPELLING ERRORS						
Do spelling and other common errors produce invalid system commands or initiate transactions different from those intended?	X				2	
Does the system recognize common misspellings of commands and execute the commands as if spelling had been correct?		X			1	
Are computer-corrected commands, values, and spellings displayed and highlighted for user confirmation		X			1	
5.15.7.11 ERRORS IN STACKED COMMANDS						
Does the system display a prompt for errors in stacked commands?			X		—	
Can the user correct the error and salvage the stack?			X		—	

DESIGN CRITERIA	YES	NO	N/A	UNK	CRITICALITY	COMMENTS
5.15.8 SYSTEM RESPONSE TIME						
Is system response time consistent with TABLE XXIX, 1472, page 247j?	X				2	
5.15.9. OTHER REQUIREMENTS						
5.15.9.2 HARD COPY						
Does the user have the capability of obtaining a paper copy of the exact contents of the alphanumeric or digital graphic displays where:						
a. mass storage is restricted?	X				2	
b. mass stored data can be lost by power interuption, or		X			3	
c. where record keeping is required?	X				3	