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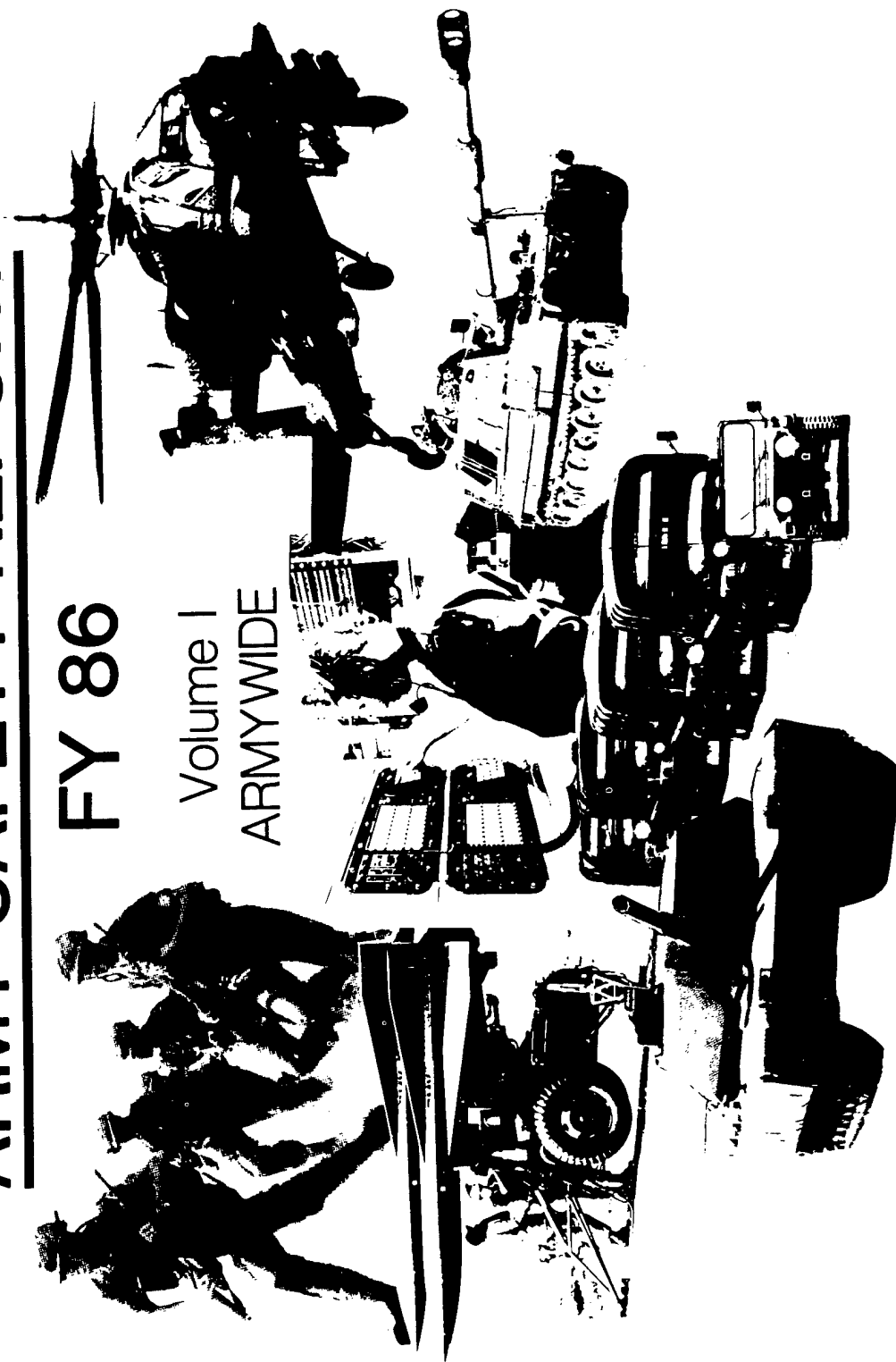


U.S. ARMY SAFETY CENTER

ARMY SAFETY REPORT

FY 86

Volume I
ARMYWIDE



DOC 86-01/01

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PREFACE

Two Volumes. This report is in two volumes. Volume I is addressed below. Volume II is under seven separate covers and presents the FY 86 accident experience for active Army battalions in seven of the Army's branches; i.e., Aviation, Field Artillery, Infantry, Signal, Armor, Air Defense Artillery, and Transportation. Volume II provide branch chiefs, schools and battalion commanders with information about accident problems across the full range of battalion activities.

Purpose. Volume I provides an overview of FY 86 Army-wide accident experience and concentrates on major types of accidents, problem areas, principal cause factors, and countermeasures. Every commander/manager can find within this report accident problem areas and cause factors associated with activities, personnel, and equipment similar to those for which he/she is responsible. It is intended that this information be used as lessons learned to generate corrective actions before personnel and equipment are lost to accidents from similar causes.

Data Notes. The FY 86 data in this report are based on ground and aviation accidents that occurred during FY 86. The exception is lost-time civilian employee injuries which are counted only by compensation claims. These claims are recorded on the Federal Employees' Compensation Act (FECA) monthly Table II computer tape provided by the Department of Labor. Some claims recorded on Table II during FY 86 were for injuries suffered in years prior to FY 86. In Part 1, accident reports (DA Form 285) involving only civilian employee injury are not counted so there is no duplicate counting.

Rates. Rates are shown where applicable to the right of bars except where otherwise noted. The base numbers for the rates are shown at the bottom of the page where applicable.

In Part 2, analysis of civilian employee involvement in the major types of accidents uses only data from DA Forms 285 and 2397 because FECA Table II data does not provide sufficient information whereby the type of accident can be identified.

The FY 86 data are based on reports of accidents recorded in the Army Safety Management Information System (ASMIS) as of 5 January 1987. Based on the rate at which FY 85 accidents were reported, it is estimated that 98.5% of the FY 86 accidents are included in this report.

EXECUTIVE SUMMARY

The Army's record of conserving resources through accident prevention was a good one in fiscal year (FY) 1986. The total number of accidents, fatalities, and non-fatal injuries decreased between FY 85 and FY 86. However, the total cost of accidents increased in FY 86. A reduction in Army motor vehicle accidents produced the improvement in FY 86 accidents and non-fatal injuries. The increase in total cost for FY 86 was primarily attributed to increases in cost associated with personnel injury accidents, other Army vehicle accidents, property-damaging accidents, and Federal Employees' Compensation Act (FECA) claims. More detailed information is contained in this report for commanders and other resource managers concerning the major types of accidents, problem areas, cause factors and countermeasures.

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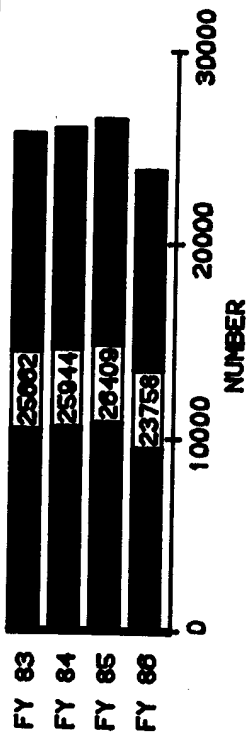
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PART 1

ACCIDENT STATISTICS

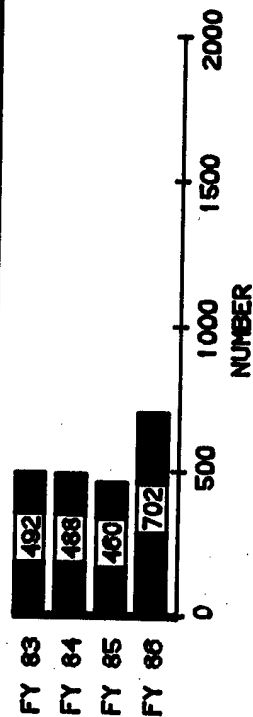
TOTAL U.S. ARMY ACCIDENT EXPERIENCE

ACCIDENTS



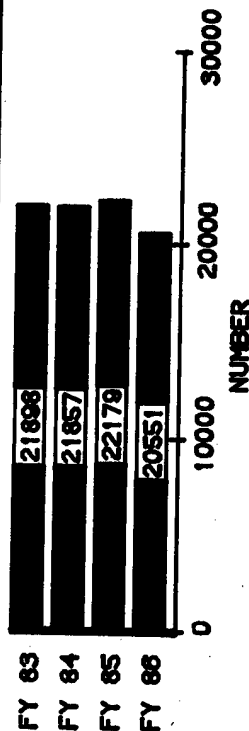
The number of accidents decreased by 10.7% (-2651) in FY 86 compared to FY 85. Decreases in Army motor vehicle (AMV) (-214), privately owned vehicle (POV) (-207), other Army vehicle (forklifts, etc.) (-110), and personnel injury accidents (-1999) account for 95% of the decrease.

FATALITIES



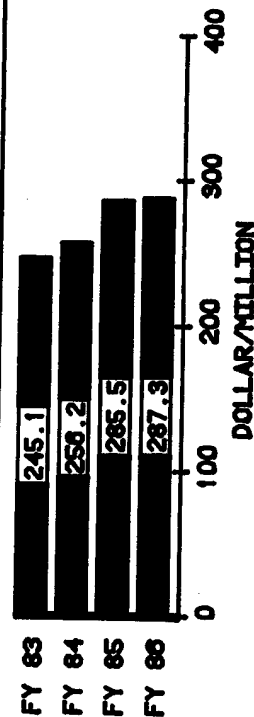
Except for the 248 fatalities resulting in the Gander accident, the downward trend in fatalities evident over the previous three years continued through FY 86. Decreases in military fatalities in all type accidents except AMV accidents offset an increase in civilian fatal FECA claims (+17). The increase in military AMV fatalities resulted primarily from an increase in Class A accidents involving 8-10 ton trucks, vans, and CUCVs; coupled with a fatal bus accident which resulted in three military fatalities who were occupants of a POV involved.

NON-FATAL INJURIES



During FY 86 a 7 percent (-1628) decrease in nonfatal injuries occurred compared to FY 85. Reductions of nonfatal injuries to military (-1069), foreign national employees (-495) and civilian FECA lost-time claims (-58) account for this decrease. Ninety-six percent of the overall reduction stems from fewer foreign national and military injuries in AMV, other Army vehicle, and personnel injury accidents, coupled with reductions in injuries to military personnel in POV accidents and fewer civilian FECA claims.

TOTAL COST

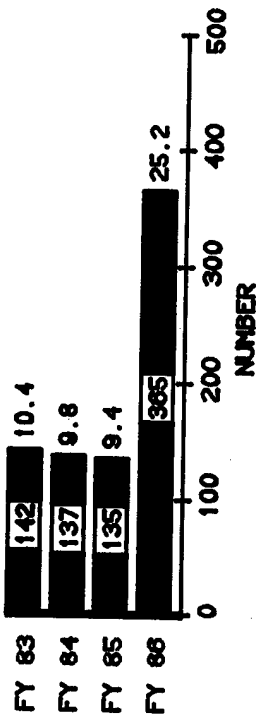


The total cost of FY 86 accidents increased by \$1.8 million. This increase is primarily attributed to increases in cost associated with other Army vehicle, personnel injury, and property-damaging accidents, and an increase of \$9.9 million in FECA claims cost. The major portion of these increases was offset by decreases in costs associated with combat vehicle accidents, POV accidents, explosions, fires, and a \$10.0 million reduction in aviation accident cost.

ON- AND OFF-DUTY INJURIES

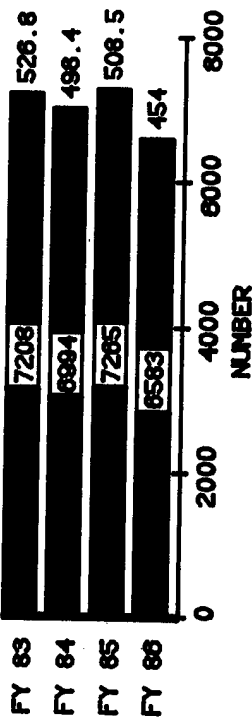
U.S. ARMY MILITARY INJURIES ON DUTY

FATALITIES



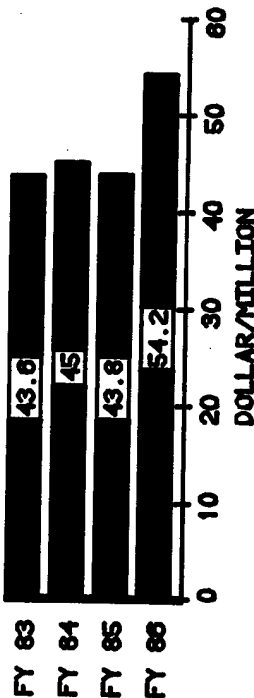
Because of the 248 military fatalities resulting from the Gander accident, the total FY 86 on-duty military fatalities increased by 170 percent. Excluding these fatalities a decreasing trend is apparent with only 117 occurring in FY 86, a decrease of 18. While fatalities associated with AMV accidents increased by four, combat vehicle and POV on-duty fatalities decreased by four each. Fatalities associated with on-duty personnel injury accidents decreased by eight. Other decreases were noted in other Army vehicle accidents (-2), explosions (-2), and aviation accidents (-3).

NON-FATAL INJURIES



A 9-percent decrease (-682) in on-duty military nonfatal injuries occurred in FY 86 compared to FY 85. Eighty-eight percent of this decrease resulted from decreases in AMV injuries (-147) and personnel injury accidents (-450). Other notable decreases occurred in on-duty POV injuries (-14), fires (-18), and explosions (-27).

INJURY COST

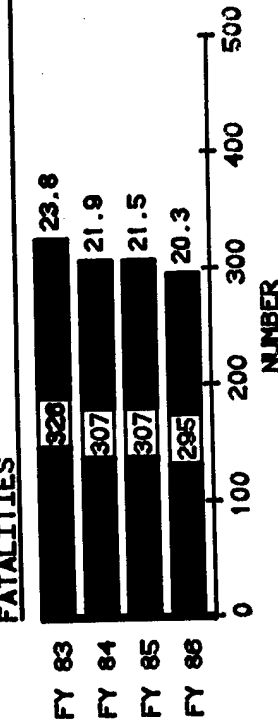


A 24-percent increase in injury cost in FY 86 is attributed to the Gander accident. Injury cost, less the Gander accident, decreased by \$4.6 million, and is attributed primarily to a decrease in injury cost of personnel injury accidents (-\$3.3 million). The remainder of the decrease is decreases in injury cost associated with combat vehicle, on-duty POV and other Army vehicle accidents, coupled with decreases in injury cost associated with fires and explosions.

INJURY RATE PER 100,000 MILITARY POPULATION

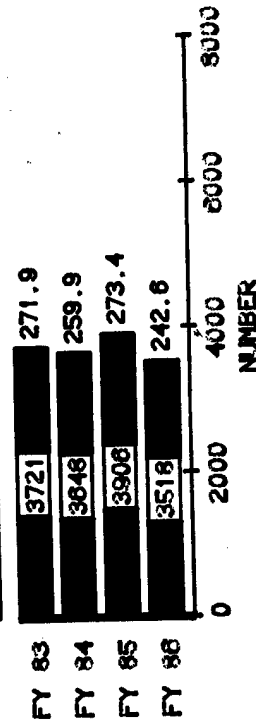
U.S. ARMY MILITARY INJURIES OFF DUTY

FATALITIES



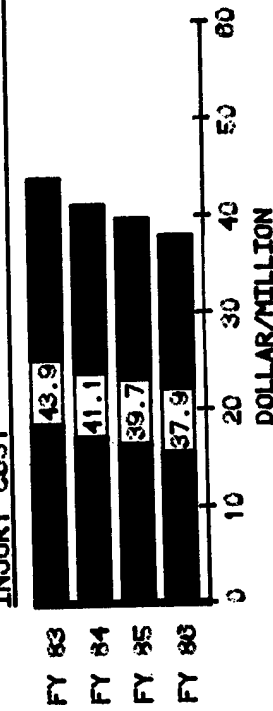
The downward trend in off-duty military fatalities continued through FY 86. Four-percent fewer (-12 fatalities) occurred in FY 86 compared to FY 85. Decreases in personnel injury fatalities (-8) and POV fatalities (-6) which were partially offset by an increase in off-duty military fatalities in AMV accidents (+2) account for the overall decrease.

NON-FATAL INJURIES



The number of off-duty injuries to military personnel during FY 86 decreased by 10-percent (-389) compared to FY 85. Decreases in off-duty nonfatal military injuries in POV (-208) and personnel injury accidents (-176) account for 99-percent of this decrease.

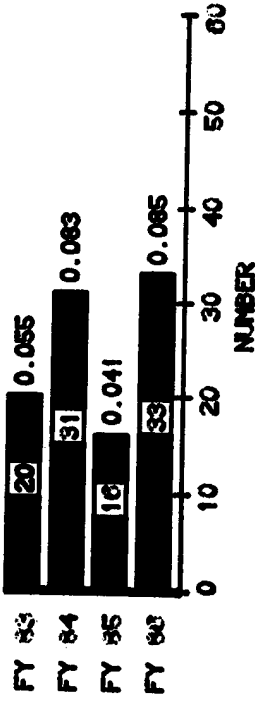
INJURY COST



As a result of the decrease in fatal and nonfatal off-duty military injuries, the cost associated with these injuries decreased by 5-percent (-\$1.8 million) in FY 86 compared to FY 85.

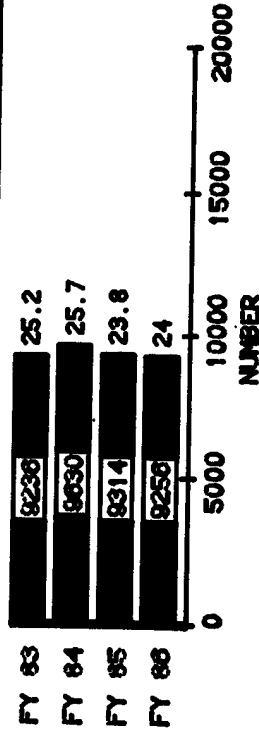
U.S. ARMY ON-DUTY CIVILIAN INJURIES CIVILIAN LOST-TIME AND FATAL FECA CLAIMS

FATALITIES



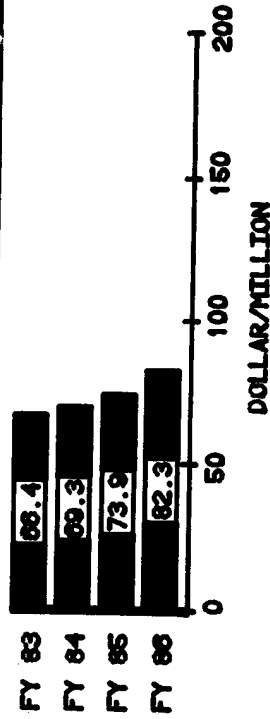
Federal Employees' Compensation Act (FECA) claims created for civilian fatalities increased by 17 in FY 86 compared to FY 85, based on Department of Labor (DOL) Office of Workers' Compensation (OWCP) Table II data.

NON-FATAL INJURIES



Civilian lost-time claims decreased by one-percent (-58) in FY 86 compared to FY 85.

CIVILIAN INJURY COST

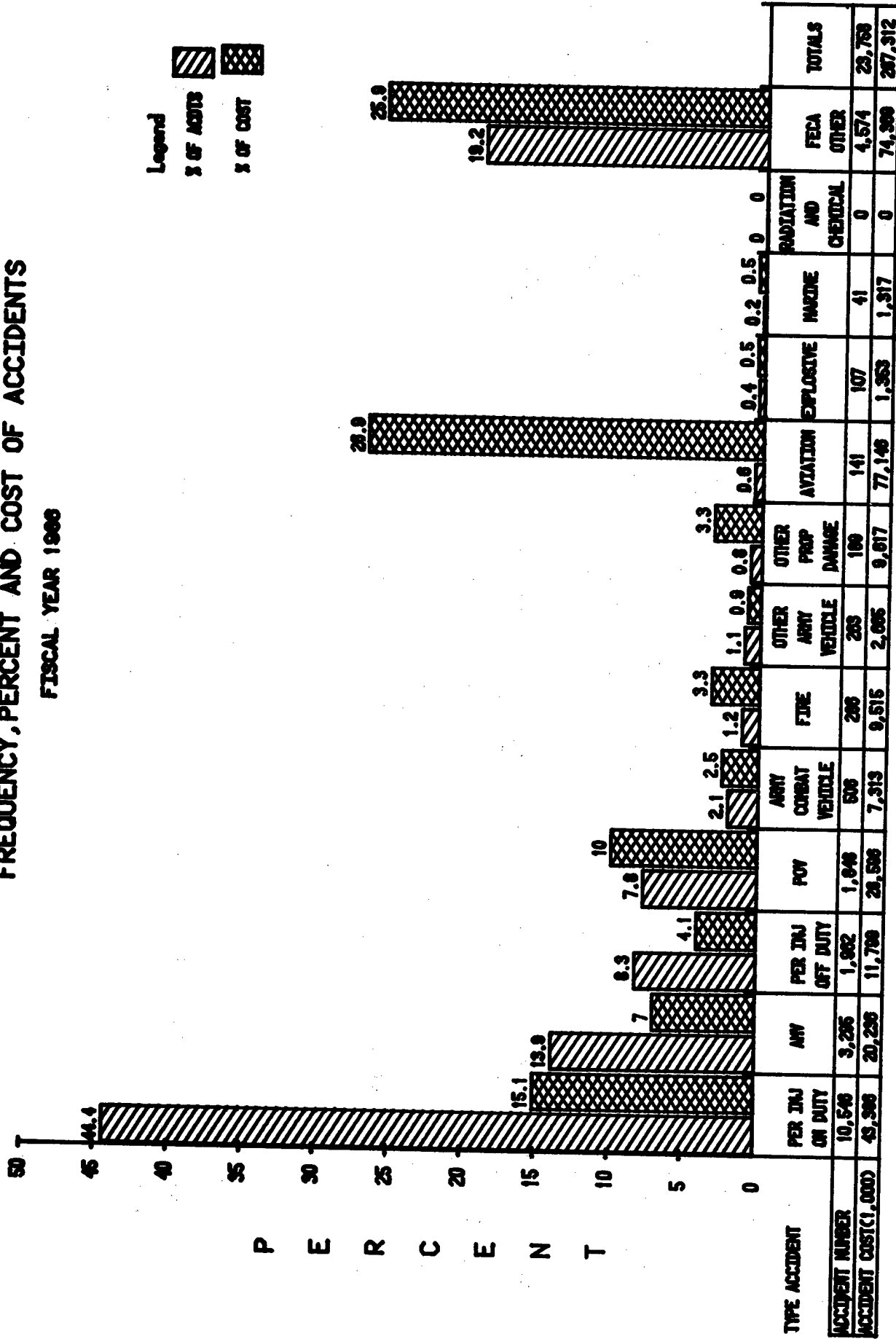


DOL cost of Army civilian lost-time and fatal claims increased by 11-percent (+\$8.4 million) in FY 86 compared to FY 85.

INJURY RATE PER THOUSAND PERSONNEL

TYPES OF ACCIDENTS

FREQUENCY, PERCENT AND COST OF ACCIDENTS FISCAL YEAR 1966



PART 2

CAUSES AND COUNTERMEASURES

This section provides an in-depth look at the top five ground accident categories (on-duty personnel injury, AMV, off-duty personnel injury, POV, Army combat vehicle) and aviation. The top problem areas and principal cause factors are identified for each accident category. Cause factor information was provided by FY 86 DA Form 2397-2-R aviation reports and DA Form 285-1 reports submitted on fatal and selected (random sample and materiel handling) serious ground accidents (damage to Army property of \$1,000 or more, loss of 20 or more workdays or a more serious injury). DA Form 285-1 reports are not required for off-duty accidents unless they involve Army operations or materiel. Therefore, cause factor information was not available for privately owned vehicle and off-duty military personnel injury accidents. A summary of DA Form 285-1 ground accident reports follows:

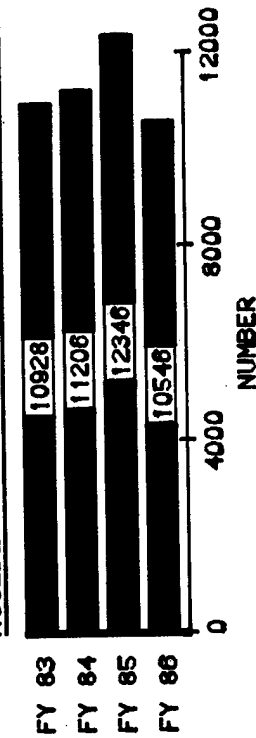
TYPE ACCIDENT	FATAL ACDTs	RANDOM SAMPLE	MATERIEL HANDLING	OTHER
Personnel Injury	23	106	128	1
AMV	54*	93	1	4
Army Combat Vehicle	9	7	3	0

* Includes twenty accidents involving fatal injuries to non-Army personnel.

PERSONNEL INJURY - OTHER

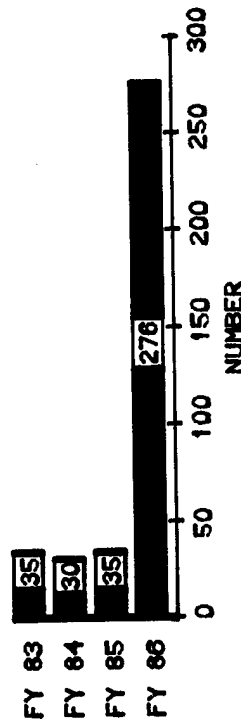
PERSONNEL INJURY ACCIDENTS ON DUTY

ACCIDENTS



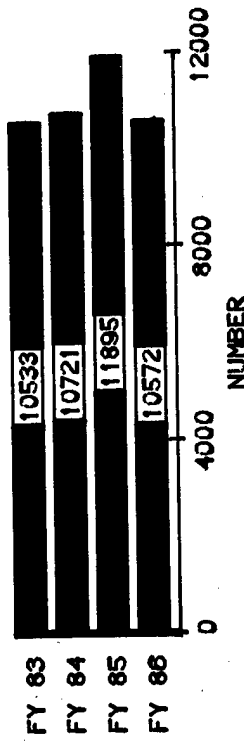
A 15-percent decrease (-1800) in on-duty military and civilian personnel injury accidents occurred in FY 86 compared to FY 85. This was fewer than any of the prior 3 years and is a reversal of the increasing trend previously experienced.

FATALITIES



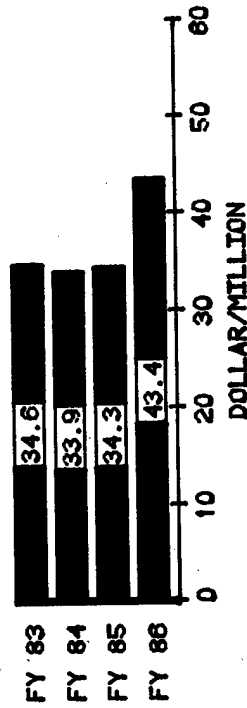
The high number of fatalities in FY 86 includes 248 in the Gander accident. Excluding these, there were only 28 in FY 86 which represents a 20-percent reduction (-7).

NON-FATAL INJURIES



Eleven-percent fewer (-1323) nonfatal injuries occurred in FY 86 compared to FY 85. Sixty-six percent of the decrease was civilian injuries of which 80-percent occurred in maintenance/repair/servicing, handling materiel/passengers, security/law enforcement activities and human locomotion. The remaining 34-percent were military injuries of which 80-percent occurred during activities involving soldiering, combat soldiering, physical training, maintenance/repair/servicing, and handling materiel/passengers.

TOTAL COST



During FY 86 injury cost increased by 27-percent, primarily as a result of \$15.0 million in injury cost resulting from the Gander accident. Exclusion of this cost shows a 17-percent reduction (-\$5.9 million) in FY 86 resulting primarily from the decrease in nonfatal injuries.

ON-DUTY PERSONNEL INJURIES - FY86

ACTIVITY	MILITARY	CIVILIAN
Maintenance/Repair/Service	593	1571
Handling Material/Passengers	489	1501
Human Locomotion	524	1078
Combat Soldiering	1263	2
Being a Passenger	521	242
Sports	496	46
Physical Training	467	10
Food/Drink Preparations	91	205
Handling Vehicle/Vessel/Animal	165	100
Office Activities	15	211
Miscellaneous (21 other activities)	645	609
Total	5269	5575
SUBTOTAL	10844	
Activity Unreported	4	
Total	10848	
		Fatalities
		Non-Fatal Injuries
		276
		10,572
		Total
		10,848

PROBLEM AREAS

Civilian injuries accounted for 51% of the on-duty personnel injuries. Military on-duty injuries accounted for the remaining 49%.

Looking at the top three activities:

a. Maintenance/repair/servicing was the number two activity for military and number one for civilians. Most of the military injuries occurred in maintenance facilities (vehicle facilities being the most prevalent) and training areas. Most of the civilian injuries occurred in maintenance facilities (vehicle facilities being the most prevalent), operational facilities and storage facilities. The most frequent task involved was installing/removing/modifying equipment.

b. Handling material/passengers was the number six activity for military and number two for civilians. Most of the military injuries occurred in training areas, operational facilities, and maintenance facilities. Most of the civilian injuries occurred in storage facilities, operational facilities, maintenance facilities and service facilities. The most frequent tasks involved for both military and civilian were transporting/moving and loading/unloading.

c. Combat soldiering was the number one activity for military personnel. Most of these injuries occurred in designated training areas. The most frequent task involved was tactical parachuting.

Data as of 5 Jan 87

ON-DUTY PERSONNEL INJURIES

PROBLEM AREA: Maintenance/Repair/Service

Maintenance/repair/servicing personnel injuries accounted for 20% of on-duty personnel injuries.

PRINCIPAL CAUSE FACTOR: Inadequate Self-Discipline (41%)

Inadequate self-discipline consists of personal characteristics such as overconfidence or improper attitudes toward job requirements that cause individuals to commit task errors that cause accidents. Examples specific to FY 86 are:

- Failure to use proper lifting technique.
- Failure to maintain three points of contact when working on tracked vehicle.

COUNTERMEASURES:

USASC distributed a Maintenance Operation Support Kit in October 86 which included materials designed to increase employee self-discipline.

USASC published general workplace safety articles in COUNTERMEASURE (Oct and Dec 85, Apr, Jun, Jul, Aug, and Sep 86).

USASC published maintenance awareness articles in PS magazine (Apr 86) and ORDNANCE magazine (Nov 86).

USASC worked with the Ordnance Center and School to ensure safety considerations are properly addressed in lesson plans, manuals, and other guidance.

USASC published maintenance safety articles in COUNTERMEASURE (Oct, Nov and Dec 85, Jan, Mar, Jun, Jul, Aug, and Sep 86).

PRINCIPAL CAUSE FACTOR: Inadequate Supervision (22%)

Supervision is inadequate when it leads to or allows accident-causing behaviors. Examples specific to FY 86 are:

- Allowing personnel to perform tasks unsafely.
- Failure to check/monitor task performance.

COUNTERMEASURES:

USASC initiated development of a Safety Resource Manual for Supervisors of civilian workers which will guide supervisors in their safety duties and responsibilities.

USASC initiated development of a resource kit of lesson plans, posters, sample SOP's, and tailgate safety training sessions for use by supervisors of maintenance activities.

PRINCIPAL CAUSE FACTOR: Inadequate Written Procedures (19%)

Inadequate written procedures are those written, unwritten-but-understood, or non-existent procedures for normal, abnormal, or emergency conditions which lead to or allow accident-causing behaviors. Specific example for FY86 is:

--No written safety policy or standing operating procedures that personnel could follow when confronted with a safety hazard.

COUNTERMEASURES:

USASC published maintenance awareness articles in PS magazine (Apr 86) and ORDNANCE magazine (Nov 86).

USASC worked with the Ordnance Center and School to ensure safety considerations are properly addressed in lesson plans, manuals, and other guidance.

USASC initiated development of a Safety Resource Manual for Supervisors of civilian workers which will guide supervisors in their safety duties and responsibilities.

USASC distributed a Maintenance Operations Support Kit in October 86 which included materials designed to enhance written procedures.

USASC published maintenance safety articles in COUNTERMEASURE (Oct, Nov and Dec 85, Jan, Mar, Jun, Jul, Aug, and Sep 86).

USASC published general workplace safety articles in COUNTERMEASURE (Oct and Dec 85, Jan, Mar, Apr, Jun, Jul, Aug, and Sep 86).

PROBLEM AREA: Handling Materiel/Passengers

Handling materiel/passengers personnel injuries accounted for 18% of on-duty personnel injuries.

PRINCIPAL CAUSE FACTOR: Inadequate Self-Discipline (55%)

Inadequate self-discipline consists of personal characteristics such as overconfidence or improper attitudes toward job requirements that cause individuals to commit task errors that cause accidents. Examples specific to FY 86 are:

- Failure to use proper lifting/carrying techniques.
- Failure to ensure equipment/material in work area was secure before performing work on/near equipment/material.
- Lack of attentiveness to walkway when carrying equipment.

COUNTERMEASURES:

USASC initiated development of a materiel handling accident prevention program. A letter requesting field input was distributed in August 86. Responses are being consolidated.

USASC published materiel handling safety articles in COUNTERMEASURE (Oct 85, Feb, Mar, Apr, May, Jun, Jul, and Aug 86).

USASC published general workplace safety articles in COUNTERMEASURE (Oct and Dec 85, Jan, Mar, Apr, Jun, Jul, Aug, and Sep 86).

PRINCIPAL CAUSE FACTOR: Inadequate Unit Training/Experience (17%)

Unit training/experience are inadequate when personnel perform accident-causing behaviors because unit training or supervised on-the-job experience provided did not prepare them to perform assigned tasks properly. Examples for FY 86 of tasks for which training/experience was inadequate are:

- Moving equipment without overexertion.
- Lifting using proper techniques.

COUNTERMEASURES:

USASC initiated development of a resource kit of lesson plans, posters, sample SOP's, and tailgate safety training sessions for use by supervisors of materiel handling activities.

USASC worked with the Ordnance Center and School to ensure safety considerations are properly addressed in lesson plans, manuals, and other guidance.

USASC initiated development of a Safety Resource Manual for Supervisors of civilian workers which will guide supervisors in their safety duties and responsibilities.

PRINCIPAL CAUSE FACTOR: Inadequate Supervision (12%)

Supervision is inadequate when it leads to or allows accident-causing behaviors. Examples specific to FY 86 are:

- Failure to enforce procedures for proper lifting of equipment.
- Assigning inadequate number of personnel to perform work tasks.

COUNTERMEASURES:

USASC initiated development of a Safety Resource Manual for Supervisors of civilian workers which will guide supervisors in their safety duties and responsibilities.

USASC worked with the Ordnance Center and School to ensure safety considerations are properly addressed in lesson plans, manuals, and other guidance.

USASC initiated development of a resource kit of lesson plans, posters, sample SOP's, and tailgate safety training sessions for use by supervisors of materiel handling activities.

PROBLEM AREA: Combat Soldiering

Combat Soldiering personnel injuries accounted for 12% of on-duty personnel injuries.

PRINCIPAL CAUSE FACTOR: Inadequate Self-Discipline (37%)

Inadequate self-discipline consists of personal characteristics such as overconfidence or improper attitudes toward job requirements that cause individuals to commit task errors that cause accidents. Examples specific to FY 86 are:

- Failure to employ proper parachute landing fall techniques.
- Failure to properly reconnoiter river crossing site.
- Failure to communicate situational hazards to fellow soldiers during training exercise.

COUNTERMEASURES:

USASC published articles addressing weapons handling in COUNTERMEASURE (Jan, Aug and Dec 86).

USASC published an article addressing MOPP-induced heat injuries in COUNTERMEASURE (Jun 86).

USASC published articles addressing tactical parachuting safety in COUNTERMEASURE (Mar and Jun 86).

COUNTERMEASURES: (cont)

USASC published an article addressing safety while swimming during field training exercises in COUNTERMEASURE (Apr 86).

USASC published an article addressing safety while rappelling in COUNTERMEASURE (Jun 86).

USASC published a tactical parachuting accident review in COUNTERMEASURE (Aug 86).

PRINCIPAL CAUSE FACTOR: Inadequate Supervision (21%)

Supervision is inadequate when it leads to or allows accident-causing behaviors. Examples specific to FY 86 are:

--Lack of adequate observation during training exercises.

--Failure to ensure proper corrective action taken during training exercises.

COUNTERMEASURES:

USASC published articles addressing tactical parachuting safety in COUNTERMEASURE (Mar and Jun 86).

USASC published an article addressing safety while swimming during field training exercises in COUNTERMEASURE (Apr 86).

USASC published an article addressing safety while rappelling in COUNTERMEASURE (Jun 86).

USASC published articles addressing weapons handling in COUNTERMEASURE (Jan, Aug and Dec 86).

USASC published an article addressing MOPP-induced heat injuries in COUNTERMEASURE (Jun 86).

PRINCIPAL CAUSE FACTOR: Inadequate Unit Training/Experience (19%)

Unit training/experience are inadequate when personnel perform accident-causing behaviors because unit training or supervised on-the-job experience provided did not prepare them to perform assigned tasks properly. Examples for FY 86 of tasks for which training/experience was inadequate are:

--Parachute landing fall techniques.

--Recognizing dangers of tactical water operations.

COUNTERMEASURES:

USASC published an article addressing MOPP-induced heat injuries in COUNTERMEASURE (Jun 86).

USASC published articles addressing tactical parachuting safety in COUNTERMEASURE (Mar and Jun 86).

USASC published an article addressing safety while swimming during field training exercises in COUNTERMEASURE (Apr 86).

USASC published an article addressing safety while rappelling in COUNTERMEASURE (Jun 86).

USASC published articles addressing weapons handling in COUNTERMEASURE (Jan, Aug and Dec 86).

PRINCIPAL CAUSE FACTOR: Inadequate Written Procedures (9%)

Inadequate written procedures are those written, unwritten-but-understood, or non-existent procedures for normal, abnormal, or emergency conditions which lead to or allow accident-causing behaviors. A specific example for FY86 is:

--Although guidance on throwing smoke grenades is available in manuals, they would not normally be reading material for the soldier.

COUNTERMEASURES:

USASC published articles addressing weapons handling in COUNTERMEASURE (Jan, Aug and Dec 86).

USASC published articles addressing tactical parachuting safety in COUNTERMEASURE (Mar and Jun 86).

USASC published an article addressing safety while swimming during field training exercises in COUNTERMEASURE (Apr 86).

USASC published an article addressing safety while rappelling in COUNTERMEASURE (Jun 86).

USASC published articles addressing MOPP-induced heat injuries in COUNTERMEASURE (Jun 86).

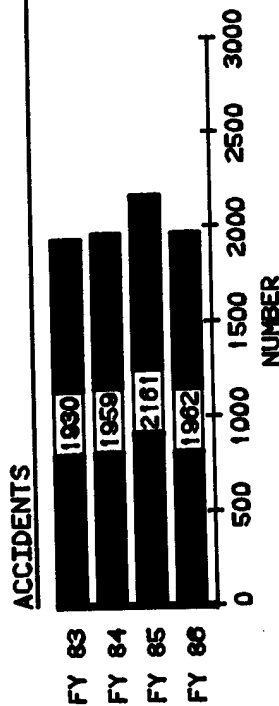
ADDITIONAL COMBAT SOLDIERING PREVENTION EFFORT

In addition to countermeasures developed, targeted, and implemented for the above cause factors, an activity was initiated in FY 86 which impacted on combat soldiering activities (specifically tactical parachuting).

USASC informed AMC of parachuting equipment design problems and recommended deficiencies be corrected.

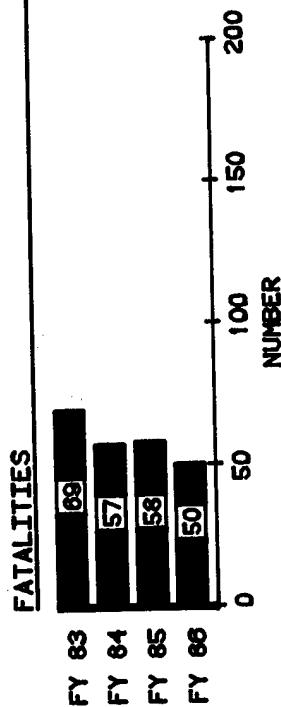
PERSONNEL INJURY ACCIDENTS OFF DUTY

ACCIDENTS



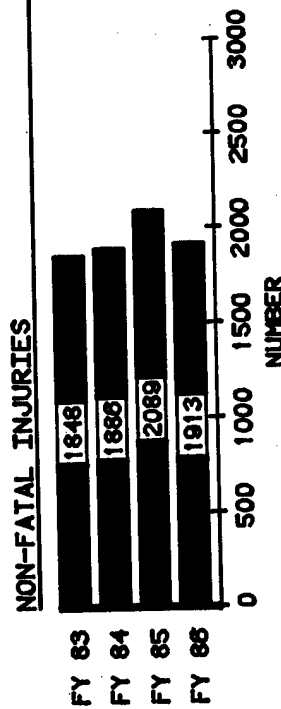
Off-duty personnel injury accidents decreased by 9-percent (-199) in FY 86 compared to FY 85. This represents a reversal of the increasing trend present over the prior three years.

FATALITIES



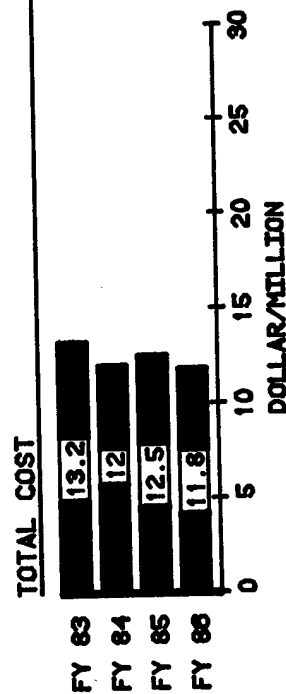
During FY 86, 14-percent fewer (-8) fatalities occurred in off-duty personnel injury accidents than in FY 85. Fatalities resulting from sports activities decreased from 33 in FY 85 to 23 in FY 86, accounting for the major portion of the overall decrease and offsetting an increase from one to six in off-duty weapons handling fatalities.

NON-FATAL INJURIES



Off-duty nonfatal injuries in personnel injury accidents decreased by 8-percent (-176) during FY 86 compared to FY 85. Reductions in nonfatal injuries during activities of sports (-128) and human locomotion (-76) offset increases in nonfatal injuries during activities involving weapons handling (+24) and handling materiel/passengers (+16) and accounted for the major part of the decrease.

TOTAL COST



As a result of the decrease in injuries, the total cost of off-duty personnel injury accidents decreased by 6-percent (-\$0.7M).

OFF-DUTY MILITARY PERSONNEL INJURIES
FY86

ACTIVITY	TOTAL INJURIES	Fatalities Non-Fatal Injuries	50 1913
Sports	940		
Human Locomotion	492		
Maintenance/Repair/Servicing	101		
Personal Hygiene/Sleeping	85		
Handling Material/Passengers	67		
Weapons Handling/Operations	48		
Food/Drink Preparation	45		
Janitorial/Housekeeping/Grounds	44		
Horseplay	42		
Being a Passenger	29		
Miscellaneous (15 other activities)	65		
Unreported	5		
Total	1963	Total	1963

Most (73%) of the off-duty military injuries occurred in two activities: sports (48%) and human locomotion (25%).

Sports. As expected, most of these injuries occurred in recreation/entertainment facilities. The sports primarily involved were basketball, softball, tackle football and touch football.

Human locomotion. These injuries involved activities such as walking, running, and climbing. Most of these injuries occurred in housing facilities (individual and family) and on travel ways (pedestrian way and roadway).

Data as of 5 Jan 87.

OFF-DUTY MILITARY PERSONNEL INJURIES

PROBLEM AREAS: Sports (basketball, softball, tackle football, touch football)
Human Locomotion (walking, running, climbing)

PRINCIPAL CAUSE FACTORS:

Principal cause factors are not reported for off-duty accidents. Therefore, countermeasures are keyed to problem areas in general.

COUNTERMEASURES:

USASC provided the U.S. Army Family and Community Support Center a draft regulation for a safety policy in Morale/Welfare/Recreation (MOR) activities.

USASC conducted an analysis of Army drowning accidents. The following actions resulted:

- AR 385-15, Water Safety, was revised and incorporated into AR 385-10, The Army Safety Program.
- An Army recreational water safety kit was developed with a projected release date of April 87.
- USASC coordinated with the U.S. Coast Guard for Armywide participation in the 1987 National Safe Boating Week. USASC distributed 1200 National Safe Boating Week Action Manuals to MACOM and installation safety offices in March 1987.
- USASC published water sports and recreation articles for COUNTERMEASURES (Apr, May, and Aug 86).

USASC developed an installation safety guide for off-duty activities. Publication is scheduled for August 1987. Included are:

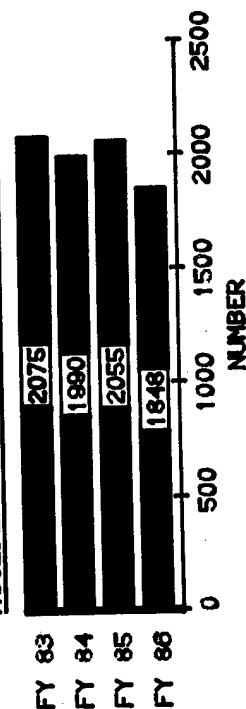
- An off-duty safety program manual.
- 44 support kits covering topics in home, community, sports, recreation, and family transportation safety.
- USASC purchased 150,000 quarterly subscriptions to the National Safety Council "Family Safety and Health Magazine" with a USASC prepared 4-page "Army Family Safety" insert for Army-wide distribution through Army community support channels. An additional 500,000 copies of the insert are being published.

USASC is revising AR 385-5, Army Sports and Recreation, to assure current accident prevention procedures are adequately addressed. A first draft is scheduled for April 87 with publication in the 2nd quarter of FY88.

PRIVATELY OWNED VEHICLES

PRIVATELY OWNED VEHICLE ACCIDENTS

ACCIDENTS



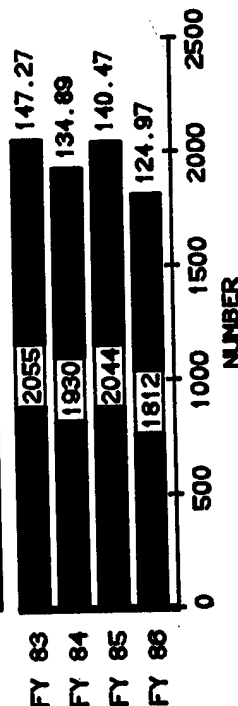
During FY 86 a 10-percent reduction (-207) in POV accidents was experienced compared to FY 85. The major contributing vehicles were motorcycles/mopeds which decreased by 32-percent (-224) and sedans/station wagons which decreased by 15-percent (-149), offsetting increases in other primary vehicle accidents.

FATALITIES



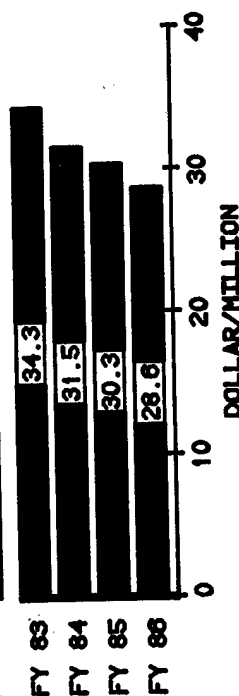
The total number of POV fatalities decreased by 4-percent (-10) in FY 86 compared to FY 85. Fatalities involving motorcycles/mopeds were down by 33-percent (-22) paralleling the reduction in these accidents. Fatalities in accidents involving sedans/station wagons increased by 16-percent (+23) which resulted primarily from an increase in multiple fatality accidents (7 in FY 85 to 15 in FY 86) which accounted for 70-percent of the increase (+16). The remaining part of the increase resulted from an increase in single fatality accidents in sedans/station wagons.

NON-FATAL INJURIES



Nonfatal injuries were down by 11-percent (-232) in FY 86 compared to FY 85. A 33-percent reduction (-222) in motorcycle injuries and a 20-percent reduction (-199) in sedan/station wagon injuries offset an increase (+188) in injuries resulting from accidents involving unidentified or unreported vehicles.

TOTAL COST



The overall reduction in POV accidents and injuries resulted in a \$1.7 million reduction in POV accident cost.

INJURY RATE PER 100,000 MILITARY POPULATION

POV ACCIDENTS
FY 86

VEHICLE	ACCIDENTS			INJURIES	
	NUMBER	%	COST	FATAL	NON-FATAL
Auto/Sedan	290	57	11,111,762	167	203
Motorcycle/Moped	103	20	3,312,550	46	60
Truck	43	8	1,484,400	21	36
Bicycle	14	3	140,950	2	12
Truck/Tractor	8	2	350,905	3	6
Van	8	2	252,491	2	6
Train	7	1	283,600	6	-
Aircraft	2	1	391,720	2	-
Trailer	1	<1	47,000	1	-
Other POV	27	5	282,935	3	23
Unreported	7	1	45,332	-	7
Total for on-duty and fatal accidents	510	100	17,703,645	253	353
Total for off-duty non-fatal accidents (abbreviated reports)	1,338	-	10,892,240	-	1,459
Total	1,848	-	28,595,885	253	1,812

Data as of 5 Jan 87

POV ACCIDENTS

Of the 1,848 POV accidents for FY 86, 72% (1338/1848) were off-duty non-fatal military POV accidents. These type accidents do not require a complete DA Form 285 and are submitted as abbreviated reports IAW AR 385-40. The information provided on these abbreviated reports is limited and does not support analysis in terms of the vehicles involved or accident cause factors. On-duty and fatal military POV accidents accounted for the remaining 28% (510/1848) of accidents. These type accidents require a complete DA Form 285 and are analyzed below.

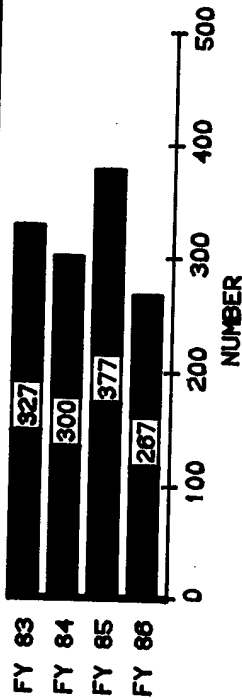
The chart shows that two types of vehicles accounted for 77% of these on-duty and fatal military POV accidents and 81% of the cost. These two types were autos/sedans and motorcycles/mopeds.

Sixty-two percent of these POV accidents (autos/sedans and motorcycles/mopeds) reported driver error. The most frequent errors reported were:

- a. Improper decision. This type error resulted most frequently in driving while under the influence of alcohol, excessive speed, failure to use personal protective devices (seat belts and helmets), and driving while fatigued.
- b. Misjudged clearance/speed/weight/size. This type of error resulted most frequently in excessive speed and loss of control.
- c. Failure to follow procedures/orders/laws. This type error resulted most frequently in excessive speed, and failure to use personal protective devices (seat belts and helmets).
- d. Improper attention. This type error resulted most frequently in loss of control, failure to yield right of way, and excessive speed.
- e. Failed to anticipate. This type error resulted primarily in loss of control.

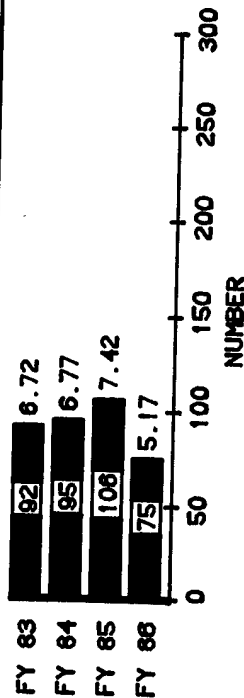
PRIVATELY OWNED VEHICLE ACCIDENTS (WITH ALCOHOL INVOLVEMENT ON PART OF ARMY OPERATOR)

ACCIDENTS



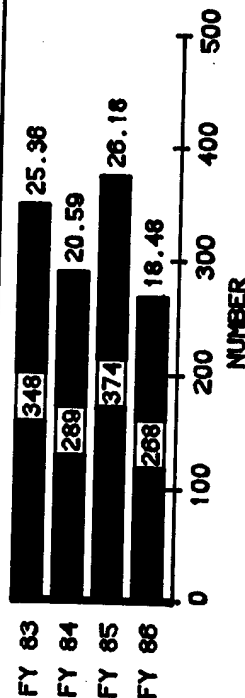
During FY 86, a 29-percent reduction (-110) was experienced in POV accidents in which the Army operator was evidenced as having consumed alcohol compared to FY 85. Decreases were experienced in all primary vehicle accidents except truck and vans which showed increases of 3 and 1, respectively. Major reductions were in motorcycle and sedan/station wagon accidents.

FATALITIES



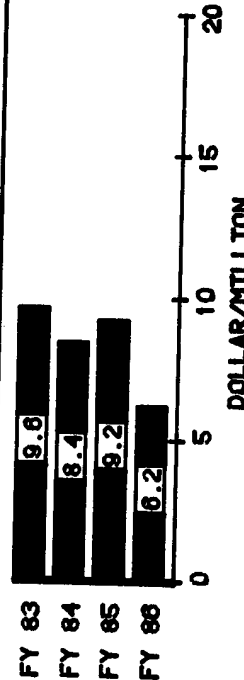
Fatalities in POV accidents in which the Army operator was identified as being involved with alcohol was down by 29-percent (-31) in FY 86 compared to FY 85. All categories of primary vehicles, especially motorcycles (-12) and sedan/station wagons (-5) showed fewer fatalities except vans which reflected one fatality in FY 86 resulting from an accident involving alcohol.

NON-FATAL INJURIES



During FY 86, nonfatal injuries in alcohol-related POV accidents were 28-percent (-106) below FY 85. All primary vehicles experienced decreases except trucks which experienced twice as many (14 in FY 85 vs. 28 in FY 86) nonfatal injuries.

TOTAL COST



The total FY 86 cost resulting from alcohol-related POV accidents was \$3.0 million below that experienced in FY 85. This reduction parallels the reduction in accidents and injuries.

INJURY RATE PER 100,000 MILITARY POPULATION

PRIVATELY OWNED VEHICLE ACCIDENTS

PROBLEM AREA: Driver Error

Improper decision, misjudged clearance/speed/weight/size, failed to follow procedures/orders/laws, improper attention, failed to anticipate.

PRINCIPAL CAUSE FACTORS:

Principal cause factors are not reported for off-duty POV accidents. Therefore, countermeasures are keyed to the problem area in general.

COUNTERMEASURES:

USASC developed the Army Motorcycle Safety Course (AMSC) to ensure standard safe riding skills are part of the soldiers' and Department of the Army Civilians' (DAC) capability before granting post registration.

USASC began development of a standard Army Driver Improvement Program (ADIP). The program differs from Defensive Driving Course (DDC) skill orientation in that the eight film modules focus on behavior and attitude and are usable at any audience level.

USASC conducted a POV symposium to identify the top priorities to solve the Army Installation POV problem. ADIP, AMSC, and changes to AR 385-55 were three of the top six priorities identified.

USASC published a Personal Protective Equipment (PPE) Policy for Installation Motorcyclist and incorporated it as part of AR 385-55.

USASC conducted a Seatbelt campaign during the summer of 1986 which had the theme "make seatbelt use a habit". In 1986, POV injury reductions were attributed to increased use of seatbelts and leader support of POV safety issues.

USASC supported a Designated Driver Program approved by the USA Family and Community Support Center. Their club system became the clearing house for USASC and NSC produced anti-drunk driving materiel and support programs.

USASC published COUNTERMEASURES articles (May and Sep 86) addressing driver safety.

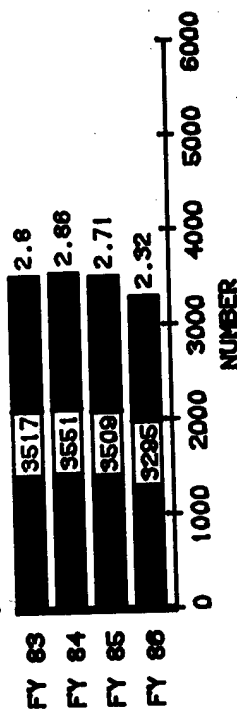
USASC prepared draft changes to AR 385-55, Prevention of Motor Vehicle Accidents.

ARMY MOTOR VEHICLES

U.S. ARMY MOTOR VEHICLE ACCIDENTS

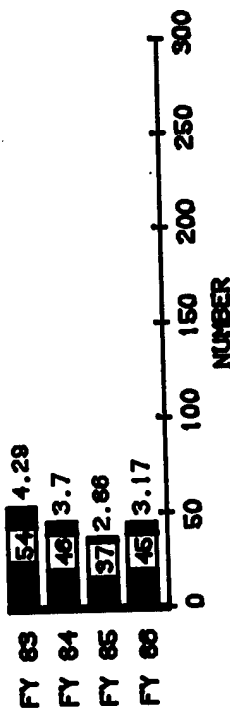
ACCIDENTS

During FY 86 the number of Army motor vehicle (AMV) accidents decreased by 6-percent (-214) compared to FY 85. Decreases in both tactical (-162) and commercial (-51) truck accidents, sedan/station wagon accidents (-102), and "other" tactical and commercial vehicle accidents (-113 and -39, respectively) accounted for the major part of the decrease, offsetting increases in High Mobility Multipurpose Wheeled Vehicle (HMMWV) (+10) and Commercial Utility Cargo Vehicle (CUCV) (+184) accidents. Notable increases were also experienced in 5-ton (+8) and 8 to 10-ton (+20) tactical truck accidents.



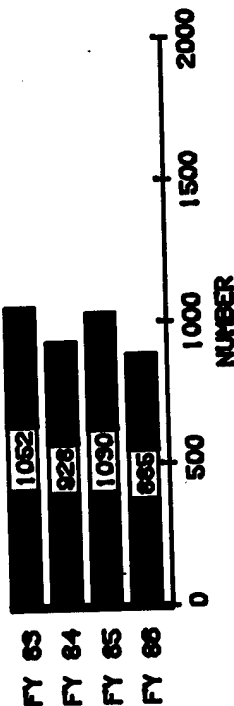
FATALITIES

Fatalities resulting from AMV accidents increased by 22-percent (+8) in FY 86 compared to FY 85. This increase is attributed primarily to 8-10 ton truck, bus, and CUCV accidents, each of which experienced two fatalities more than had been experienced in FY 85.



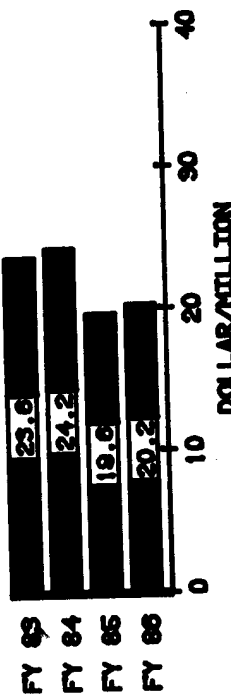
NON-FATAL INJURIES

Nonfatal injuries were down by 14% (-145) in FY 86 compared to FY 85. This reduction was almost entirely a reduction in military injuries with only one less civilian injury in FY 86. Decreases in injuries to military personnel in accidents involving both tactical (-116) and commercial (-9) trucks, as well as "other" tactical vehicle (-33) account for the major portion of the decrease. These decreases offset increases in injuries to military personnel in accidents involving sedans/station wagons (+4), HMMWV (+4), and CUCV (+23).



TOTAL COST

The total cost of AMV accidents remained relatively stable in FY 86 compared to FY 85 with only a 3-percent increase (\$0.6M). This increase is attributed to an increase in injury cost resulting from the increase in fatal and the more severe permanent total (+3) and permanent partial (+7) disabling injuries.



ACCIDENT RATE PER HUNDRED MILES
FATALITY RATE PER HUNDRED MILES

AMV ACCIDENTS - FY 86

VEHICLE	NUMBER	ACCIDENTS		COST	INJURIES	
		%			FATAL	NON-FATAL
TACTICAL						
CUCV	374	11		1,789,241	3	76
1/4-Ton Truck	325	10		2,888,757	10	220
5-Ton Truck	314	10		2,772,009	7	72
2 1/2-Ton Truck	240	7		2,770,131	5	73
M880/890 Truck	130	4		898,758	4	47
Over 10-Ton Truck	98	3		874,522	1	9
8- & 10-Ton Trucks	52	2		643,081	2	10
Gamma Goat	35	1		233,738	1	23
Tactical Trailer	31	1		124,359	-	5
HMMWV	12	1		74,859	-	5
HET	8	<1		27,718	-	-
1/2- & 1 1/2-Ton Trucks	5	<1		6,351	-	2
Other Tactical Vehicles	254	8		1,582,483	3	79
COMMERCIAL						
Sedan/Station Wagon	729	22		2,378,048	2	99
Van	211	6		914,790	1	53
1/4- & 3/4-Ton Trucks	81	2		372,613	1	13
Bus	72	2		523,725	3	4
Over 2-Ton Truck	47	1		123,080	-	18
CJ5/6/7	20	1		142,404	1	7
Truck-Tractor	15	1		28,211	-	-
Rental Vehicle(Short-term)	11	1		65,320	-	4
Motorcycle/Moped	7	<1		52,015	-	7
Trailer	6	<1		215,192	1	4
1- & 2-Ton Trucks	6	<1		14,758	-	2
Contractor Vehicle	1	<1		6,150	-	-
Bicycle	1	<1		1,500	-	1
Other Commercial Vehicle	210	6		712,545	-	52
Total	3,295	100		20,236,358	45	885

This chart shows that five types of vehicles accounted for 60% of the AMV accidents and 62% of the cost. These five types were sedans/station wagon, CUCV, 1/4-ton truck, 5-ton trucks, and 2 1/2-ton trucks. In the following paragraphs, accidents involving these vehicles are analyzed with respect to driver errors and materiel failures.

Data as of 5 Jan 87

AMV ACCIDENTS INVOLVING DRIVER ERROR FY86

Type Vehicle	No. of Accts.	Driver Error*				
		Improper Attention	Misjudged Clearance/Speed/Weight Size	Improper Decision	Failed to Anticipate	Failed to Follow Procedures/Orders/Laws
Sedan/Station Wagon	334	24	19	20	15	8
CUCV	255	20	15	19	17	11
1/4-Ton Truck	229	14	17	17	17	9
5-Ton Truck	219	17	24	11	18	14
2 1/2-Ton Truck	151	15	18	12	13	18
					Percent of Errors	
					15	8
					17	11
					17	9
					18	14
					13	8
					12	18

*Of 14 driver errors available for selection by field investigators, the 6 shown were reported with the greatest frequency for accidents involving the top 5 vehicles.

Sixty percent of these AMV accidents (sedans/station wagon, CUCV, 1/4-ton trucks, 5-ton trucks, and 2 1/2-ton trucks) involved driver error. As shown in the chart, the most frequent errors were:

- Improper attention. This error resulted primarily in loss of control and failure to yield the right-of-way.
- Misjudged clearance/speed/weight/size. This type error resulted primarily in loss of control and using excessive speed.
- Improper decision. This type error resulted primarily in excessive speed, loss of control, and driving while under the influence of alcohol.
- Failed to anticipate. This error resulted primarily in loss of control.
- Failed to follow procedures/orders/laws. This error resulted primarily in failure to yield right-of-way, excessive speed, and improper backing.
- Failed to recognize. These errors resulted primarily in loss of control.

Data as of 5 Jan 87

**AMV ACCIDENTS INVOLVING MATERIEL FAILURES
FY 86**

TYPE OF VEHICLE	NO. OF ACDTS	PERCENT OF ACCIDENTS BY COMPONENT				
		Wheels	Brakes	Steering	Other	Unreported
Sedan/Station Wagon	22	41	32	14	13	-
CUCV	10	40	30	10	10	10
1/4-Ton Truck	21	33	29	10	28	-
5-Ton Truck	41	76	10	5	5	4
2 1/2-Ton Truck	45	64	20	5	5	6

Only 7% of these AMV accidents involved materiel failure/malfunction. As shown on the chart, the most frequent components involved were:

- a. Brakes. Brake failures most frequently involved the loss of brake fluid due to poor maintenance of brake lines and master cylinders. Additionally, improperly maintained hydrovacs appear to be a major problem.
- b. Wheels (rims and tires/tubes combined). Blowouts were responsible for most tire failures. While improper inspection of tires prior to dispatch was a cause factor, the most frequent cause factor was using recap tires on the front end of vehicles.

Data as of 5 Jan 87

ARMY MOTOR VEHICLES

PROBLEM AREA: Driver Error

Misjudged clearance/speed/weight/size, improper attention, improper decision, failed to anticipate, failed to follow procedures/orders/laws, failed to recognize.

PRINCIPAL CAUSE FACTOR: Inadequate Self-Discipline (37%)

Inadequate self-discipline consists of personal characteristics such as overconfidence or improper attitudes toward job requirements that cause drivers to commit task errors that cause accidents. Examples specific to FY 86 are:

- Failure to adjust speed for road conditions, traffic conditions, or vehicle design.
- Failure to pay attention to road/driving.
- Misjudging clearance between vehicles.
- Failure to maintain adequate following distances.

COUNTERMEASURES:

USASC developed articles for COUNTERMEASURE dealing with seatbelts (Oct 85 and Sep 86), safe operation of the CUCV (Nov 85), safe operation of M939 trucks (Feb 86), safe operation of the HEMTT (Mar 86), safe towing of M198 155mm howitzers (Jul and Sep 86), safe operation of the HMMWV (Aug 86), prevention of convoy accidents (Sep 86), and vehicle markings (Sep 86).

The Transportation School produced and fielded (1st QTR 86) FC 55-32, Driver Selection, Training and Supervision in Units: Tactical Wheeled Vehicle Operator.

USASC produced and fielded a Commander's Guide to AMV Accident Prevention Kit containing posters and general and specific suggested countermeasures.

USASC revised AR 600-55 to update driver selection and licensing procedures and strengthen driver training requirements; distributed 4th QTR 86.

USASC worked with the Transportation School in developing simulator-enhanced driver training.

USASC developed articles for COUNTERMEASURE relating to the problem of drinking and driving (Oct and Nov 85, May and Jul 86).

USASC revised AR 385-55, Prevention of Motor Vehicle Accidents, to include reduction of maximum driving time in AMVs.

COUNTERMEASURES: (continued)

USASC developed articles for COUNTERMEASURE dealing with the danger of driving when fatigued (Oct 85, May, Jun, and Sep 86).

PRINCIPAL CAUSE FACTOR: Inadequate Unit Training/Experience (22%)

Unit training/experience are inadequate when personnel perform accident-causing behaviors because unit training or supervised on-the-job experience provided did not prepare them to perform assigned tasks properly. Examples for FY 86 of tasks for which training/experience was inadequate are:

- Adjusting speed for road conditions and vehicle design.
- Anticipating actions of pedestrians in foreign countries.
- Maintaining adequate following distances.
- Judging clearance between vehicles.

COUNTERMEASURES:

USASC developed articles for COUNTERMEASURE dealing with safe operation of the CUCV (Nov 85), importance of tire inspection and correct pressure (Nov 85), driver training (Nov 85), safe operation of M939 trucks (Feb 86), safe operation of the HEMTT (Mar 86), safe operation of the HMMWV (Aug 86), seatbelts in tactical vehicles (Sep 86), prevention of convoy accidents (Sep 86), vehicle markings (Sep 86).

The Transportation School produced and fielded (1st QTR 86) FC 55-32, Driver Selection, Training and Supervision in Units: Tactical Wheeled Vehicle Operator.

USASC recommended development of exportable driver training packets for each type vehicle. As a result, AMC agreed with the concept of adding a special driver training chapter to each vehicle -10 operator's manual.

USASC produced and fielded a Commander's Guide to AMV Accident Prevention Kit containing posters and general and specific suggested countermeasures.

USASC revised AR 600-55 to update driver selection and licensing procedures and strengthen driver training requirements; distributed 4th QTR 86.

USASC worked with the Transportation School in developing simulator-enhanced driver training.

USASC worked with the Transportation School to begin writing a standardized Army driver training program.

PRINCIPAL CAUSE FACTOR: Inadequate supervision (19%)

Supervision is inadequate when it leads to or allows accident-causing behaviors. Examples specific to FY86 are:

- Failure to ensure driver maintained proper speed for road and traffic conditions.
- Failure to ensure driver followed standard vehicle operating procedures.
- Failure to ensure driver maintained adequate following distances.

COUNTERMEASURES:

USASC developed articles for COUNTERMEASURE dealing with seatbelts (Oct 85 and Sep 86), safe operation of the CUCV (Nov 85), safe operation of M939 trucks (Feb 86), safe operation of the HEMTT (Mar 86), safe towing of M198 155mm howitzers (Jul and Sep 86), safe operation of the HMMWV (Aug 86), prevention of convoy accidents (Sep 86), and vehicle markings (Sep 86).

The Transportation School produced and fielded (1st QTR 86) FC 55-32, Driver Selection, Training and Supervision in Units: Tactical Wheeled Vehicle Operator.

USASC produced and fielded a Commander's Guide to AMV Accident Prevention Kit containing posters and general and specific suggested countermeasures.

USASC revised AR 600-55 to update driver selection and licensing procedures and strengthen driver training requirements; distributed 4th QTR 86.

PRINCIPAL CAUSE FACTOR: Inadequate written procedures (7%)

Inadequate written procedures are those written, unwritten-but-understood, or non-existent procedures for normal, abnormal, or emergency conditions which lead to or allow accident-causing behaviors. Specific example for FY86 is:

- Standing operating procedure (SOP) did not provide guidance for safe parking of vehicles in the motor pool.
- SOP did not adequately address the hazards and poor roads found outside continental United States.

COUNTERMEASURES:

The Transportation School produced and fielded (1st QTR 86) FC 55-32, Driver Selection, Training and Supervision in Units: Tactical Wheeled Vehicle Operator.

USASC worked with the Transportation School to begin writing a standardized Army driver training program.

COUNTERMEASURES: (continued)

USASC recommended development of exportable driver training packets for each type vehicle. As a result, AMC agreed with the concept of adding a special driver training chapter to each vehicle -10 operator's manual.

USASC revised AR 600-55 to update driver selection and licensing procedures and strengthen driver training requirements; distributed 4th QTR 86.

USASC revised AR 385-55, Prevention of Motor Vehicle Accidents.

PRINCIPAL CAUSE FACTOR: Fatigue (5%)

Fatigue is a temporary physical and/or mental state that causes individuals to make accident-causing errors due to reduced physical or mental capabilities resulting from previous activity and/or lack of rest.

COUNTERMEASURES:

USASC revised AR 385-55, Prevention of Motor Vehicle Accidents, to include reduction of maximum driving time in AMVs.

USASC developed articles for COUNTERMEASURE dealing with the danger of driving when fatigued (Oct 85, May, Jun and Sep 86).

PRINCIPAL CAUSE FACTOR: Effects of Alcohol/Drugs/Illness (4%)

The effects of alcohol/drugs/illness cause individuals to make accident-causing errors due to reduced physical or mental capabilities.

COUNTERMEASURES:

USASC developed articles for COUNTERMEASURE relating to the problem of drinking and driving (Oct and Nov 85, May and Jul 86).

PROBLEM AREA: Materiel Failure

Brakes and wheels

PRINCIPAL CAUSE FACTOR:

Principal cause factors were not identified on the majority of Army motor vehicle materiel failures. Therefore, the information below is based on the small number of accidents which reported principal cause factors.

Inadequate maintenance (100%)

Maintenance is inadequate when it causes or contributes to an accident-causing materiel failure/malfuction.

Note: Due to the small number of cases available, examples would not necessarily be representative and are therefore not reported.

COUNTERMEASURES:

USASC developed articles for COUNTERMEASURE dealing with batteries (Oct 85), CUCV tires (Nov 85), CUCV and M101A2 trailer tire hazards (Jan 86), importance of tire inspection and correct pressure (Nov 85), faulty brakes (Jun and Sep 86), 2 1/2-ton brake problem (Sep 86), inadequate maintenance (Dec 85, Mar, Jun, Jul and Sep 86), importance of QDR/EIRs (Jan 86), and vehicle markings (Sep 86).

USASC produced and fielded a Commander's Guide to AMV Accident Prevention Kit containing posters and general and vehicle specific suggested countermeasures.

Safety advisory messages were issued by TACOM addressing 2 1/2-ton truck transmissions (Oct 85), XM1048 trailer brakes (Nov 85), CUCV wheel bearings (Dec 85), 2 1/2-ton truck brake cylinders (Aug 86), M880 fuel filters (Aug 86), M939 truck brakes (Sep 86), leaking CUCV brake combination valve (Sep 85), HMMWV brake pedal changeout (Jan 86), M915 Jake brake (Aug 86), and M939 series brake system (Sep 86).

USASC submitted DA Form 2028, Recommended Changes to Publications on brake PMCS in TM 9-2320-209-10-2 and TM 9-2320-209-20-3-2 (Jul 86).

HQDA Tactical Truck Action Group (TACTAG) recommended a service life extension program (SLEP) for 2 1/2- and 5-ton trucks which would include appropriate brake improvements.

USASC developed articles for COUNTERMEASURE dealing with tire care (Nov 85) and the importance of QDR/EIRs (Jan 86).

ADDITIONAL ARMY MOTOR VEHICLE ACCIDENT PREVENTION EFFORTS

In addition to countermeasures developed, targeted, and implemented for the above cause factors, some activities continued or were initiated in FY 86 which should impact on Army motor vehicle accidents/injuries in general.

As a result of USASC recommendation, DCSOPS approved development of a PIP for a rollover protection system (ROPS) for the GOER.

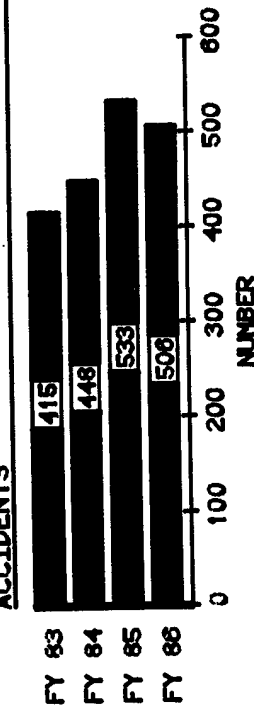
TACOM completed development of the M151 rollbar and restraints and kits have gone into production.

USASC recommended seatbelts and rollover protection be required for the family of medium tactical vehicles projected to replace 2 1/2- and 5-ton trucks. Seatbelts and rollover protection are now requirements of the system specifications document.

COMBAT VEHICLES

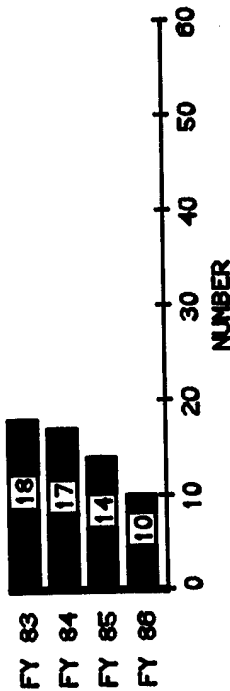
COMBAT VEHICLE ACCIDENTS

ACCIDENTS



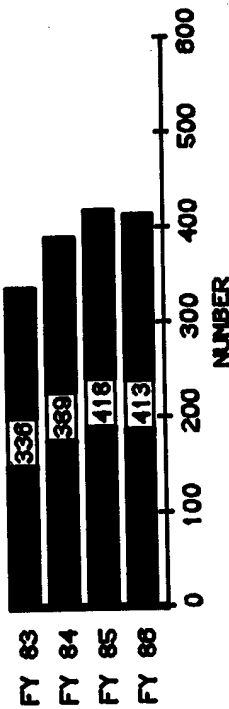
The number of combat vehicle accidents decreased by 5-percent (-27) in FY 86 compared to FY 85. Fewer accidents involving the M60 tank (-10), the M1 tank (-8), the M113 carrier (-14), and other carriers (-19), which offset increases in accidents involving the Sheridan (+6), self-propelled Howitzers (+8), the Combat Engineer Vehicle (CEV) (+2), and the Bradley Fighting Vehicle (BFV) (+2) account for the major portion of this decrease.

FATALITIES



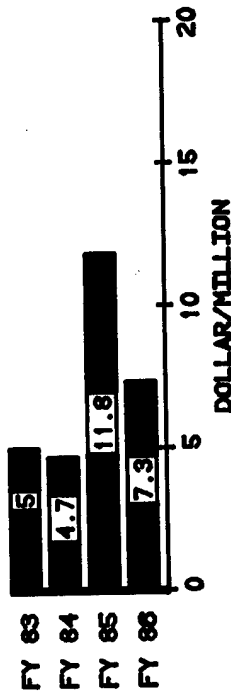
Fatalities decreased by 29-percent (-4) in FY 86 compared to FY 85. This reduction continued the decreasing trend present over the prior 3 years.

NON-FATAL INJURIES



A 1-percent decrease (-5) in nonfatal injuries occurred in FY 86 in comparison with FY 85. A decrease in injuries involving the M60 tank (-10) and the M113 carrier (-12), which offset increases in injuries involving the Sheridan (+9), the CEV (+2), and the BFV (+8) account for the major portion of this decrease.

TOTAL COST



A 38-percent decrease (-\$4.5M) in accident cost occurred in FY 86 compared to FY 85. This reduction is attributed to a reduction of \$4.0 million in property damage cost of accidents involving the M1 tank and a reduction of \$0.6 million in injury cost resulting from the decrease in both fatal and nonfatal injuries.

COMBAT VEHICLE ACCIDENTS

VEHICLE	NUMBER	ACCIDENTS		COST	INJURIES	
		%			FATAL	NON-FATAL
M60 tank	119	24		1,196,085	3	82
M113 carrier	115	23		788,380	4	116
Other carrier	74	15		1,735,637	3	64
M1 tank	51	10		451,273	-	32
SP guns and Howitzer	50	10		247,049	-	41
Fighting Vehicles	27	5		1,402,432	-	27
M48 tank	16	3		94,407	-	16
VTR	13	3		632,680	-	5
M551 Sheridan	13	2		85,100	-	16
Other tank	12	2		451,705	-	10
AVLB	7	1		58,425	-	1
CEV	5	1		159,950	-	2
Other track vehicle	4	1		10,135	-	1
Total	506	100		7,313,258	10	413

This chart shows that five types of vehicles accounted for 81% of the combat vehicle accidents and 60% of the cost. These five types were M60 tanks, M113 carriers, other carriers, M1 tanks, and SP guns and howitzers. The reason for a separate category entitled "other carriers" is because, although they have the same basic chassis as the M113, they have different equipment and are used for different tasks (e.g., M577 command carrier, M548 ammo carrier). In the following paragraphs, accidents involving these vehicles are analyzed with respect to driver error and materiel failure.

Data as of 5 Jan 87

COMBAT VEHICLE ACCIDENTS INVOLVING DRIVER ERROR
FY86

Type Vehicle		Driver Error*						Improper Attention
		Misjudged Clearance/Speed/Weight/Size	Failed to Follow Procedures/Orders/Laws	Failed to Anticipate	Improper Decision	Failed to Recognize	Inadequate Inspection/Search	
	No. of Accts.					Percent of Errors		
M60 Tank	16	39	-	11	17	11	-	6
M113 Carrier	46	12	27	14	12	12	12	6
Other Carrier	33	24	14	19	11	8	11	13
M1 Tank	3	67	-	-	-	-	-	-
SP Guns & Howitzers	6	17	17	50	16	-	-	-

*Of 14 driver errors available for selection by field investigators, the 7 shown were reported with the greatest frequency for accidents involving the top 5 vehicles.

Twenty-five percent of these combat vehicle accidents (M60 tank, M113 carrier, other carrier, M1 tank, SP guns and howitzers) involved driver error. As shown in the chart, the most frequent errors were:

- a. Misjudged clearance/speed/weight/size. This type error resulted primarily in loss of control.
- b. Failed to follow procedures/orders/laws. This type error resulted most frequently in failing to lock/block/secure and the individual exposing himself to harm.
- c. Failed to anticipate. This type error resulted primarily in loss of control.
- d. Improper decision. This type error resulted most frequently in loss of control, failing to lock/block/secure, and use of excessive speed.
- e. Failed to recognize. This type error resulted most frequently in loss of control.
- f. Inadequate inspection/search. This type error resulted primarily in failure to lock/block/secure.
- g. Improper attention. This type error resulted primarily in failure to lock/block/secure, loss of control, and exposing self to harm.

COMBAT VEHICLE ACCIDENTS INVOLVING MATERIEL FAILURES
FY 86

TYPE OF VEHICLE	NO. OF ACDTS	PERCENT OF ACCIDENTS BY COMPONENT				
M60 Tank	14	Brakes	Body	Tracks	Other	Unreported
		29	21	14	29	7
M113 Carrier	7	Axles	Hatches	Engine	Steering	Transmission
		14	14	14	14	29
Other Carrier	14	Hatches	Steering	Tracks	Other	Unreported
		29	29	14	14	14
M1 Tank	5	Tracks	Hatches	Unreported		
		80	20	-		
SP Guns & Howitzers	6	Hatches	Weapon	Unreported		
		50	33	17		

Only 11% of these combat vehicle accidents involved materiel failure/malfunction. As shown on the chart, the most frequent components involved were:

- Hatches. Malfunctions due primarily to failure to failure to secure and maintain locking device of hatches.
- Tank/carrier tracks. The most frequent malfunctions were sheared sprockets and broken tracks.
- Tank brakes. Most common malfunction was parking brake failure.
- Steering. Malfunctions involved locked laterals or loose locking pins.

Data as of 5 Jan 87

COMBAT VEHICLES

PROBLEM AREA: Driver Error

Misjudged clearance/speed/weight/size, failed to follow procedures/orders/laws, failed to anticipate, improper decision, improper attention, inadequate inspection/search.

Note: The principal cause factors were not identified for the majority of Army combat vehicle driver errors. Therefore, the information below is based on the small number of accidents which reported cause factors.

PRINCIPAL CAUSE FACTOR: Inadequate Experience (50%)

Experience is inadequate when personnel perform accident-causing behaviors because on-the-job experience provided did not prepare them to perform assigned tasks properly.

Note: Due to the small number of cases available, examples would not necessarily be representative and are therefore not reported.

COUNTERMEASURES:

USASC produced and fielded a Commander's Guide, Armor Loss Control Support Packet. This is a prevention kit containing posters and material designed to assist commanders with specific countermeasure suggestions.

USASC revised AR 600-55 to update driver selection and licensing procedures and strengthen driver training requirements; distributed 4th QTR 86.

USASC assisted in revising AR 385-55, Prevention of Motor Vehicle Accidents.

USASC worked with the Armor School in developing realistic driver training for tank drivers.

USASC developed articles related to the problem of driver training in COUNTERMEASURE (Oct and Dec 85, Jan, Apr, May, Jun, Jul and Aug 86).

PRINCIPAL CAUSE FACTOR: Inadequate Self-Discipline (34%)

Inadequate self-discipline consists of personal characteristics such as overconfidence or improper attitudes toward job requirements that cause individuals to commit task errors that cause accidents.

Note: Due to the small number of cases available, examples would not necessarily be representative and are therefore not reported.

COUNTERMEASURES:

USASC produced and fielded a Commander's Guide, Armor Loss Control Support Packet. This is a prevention kit containing posters and material designed to assist commanders with specific countermeasure suggestions.

USASC revised AR 600-55 to update driver selection and licensing procedures and strengthen driver training requirements; distributed 4th QTR 86.

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USASC developed articles related to the problem of driver training for COUNTERMEASURE (Oct and Dec 85, Jan, Apr, May, Jun, Jul and Aug 86).

USASC worked with the Armor School in developing realistic driver training for tank drivers.

USASC has requested changes to the TM/Manuals concerning usage of NVG for better night maneuverability in a field environment.

PRINCIPAL CAUSE FACTOR: Inadequate Supervision (16%)

Supervision is inadequate when it leads to or allows accident-causing behaviors.

Note: Due to the small number of cases available, examples would not necessarily be representative and are therefore not reported.

COUNTERMEASURES:

USASC produced and fielded a Commander's Guide, Armor Loss Control Support Packet. This is a prevention kit containing posters and material designed to assist commanders with specific countermeasure suggestions.

USASC revised AR 600-55 to update driver selection and licensing procedures and strengthen driver training requirements; distributed 4th QTR 86.

USASC assisted in revising AR 385-55, Prevention of Motor Vehicle Accidents.

USASC developed articles related to the problem of driver training for COUNTERMEASURE (Oct and Dec 85, Jan, Apr, May, Jun, Jul and Aug 86).

PROBLEM AREA: Materiel Failure

Hatches, tracks, axles, brakes, transmission, weapon systems, engine.

Note: The principal cause factors were not identified for the majority of Army combat vehicle materiel failures. Therefore, the information below is based on the small number of accidents which reported cause factors.

PRINCIPAL CAUSE FACTOR: Inadequate Written Procedures (50%)

Inadequate written procedures are those written, unwritten-but-understood, or non-existent procedures for normal, abnormal, or emergency conditions which lead to or allow accident-causing materiel failures/malfunctions.

Note: Due to the small number of cases available, examples would not necessarily be representative and are therefore not reported.

COUNTERMEASURES:

USASC assisted the Armor School in developing TM guidelines for using the parking brake.

USASC has recommended changes, through TACOM, for guidelines on tank brake pressure versus parking brake pressure.

PRINCIPAL CAUSE FACTOR: Inadequate Maintenance (50%)

Maintenance is inadequate when it causes or contributes to an accident-causing materiel failure/malfunction.

Note: Due to the small number of cases available, examples would not necessarily be representative and are therefore not reported.

COUNTERMEASURES:

USASC developed articles for COUNTERMEASURE dealing with Hatch Accidents (Oct 85), Safety Profile M60A/M60A3 (Dec 85), One-time Inspection of M578 and M110A2 Brake Systems (Jan 86), M88A1 Hatch Weld Faults (Jun 86), Hatch Traps (Jul 86), NVG Driving (Jul, Aug 86), Hatch Safety Pin (Sep 86), Safety Profile M110A2 Howitzer (Oct 86), and Combat Vehicle Hatch (Nov 86).

USASC has been tracking frequency and types of brake failures through the use of the Recommendation Tracking System.

USASC provided AMC, TACOM and Fort Knox with information, printouts and actions related to brake failures in armor vehicles.

COUNTERMEASURES: (cont)

USASC assisted in the production of the film, Operating Track Vehicles the Safe Way, PIN(70431).

USASC coordinated with AMC Safety Office to redesign the MILES Kill Light Indicator so that it does not interfere with night vision while driving.

USASC worked with TACOM Safety Office and General Dynamics engineers to design turret safety screens to prevent crewmember injuries.

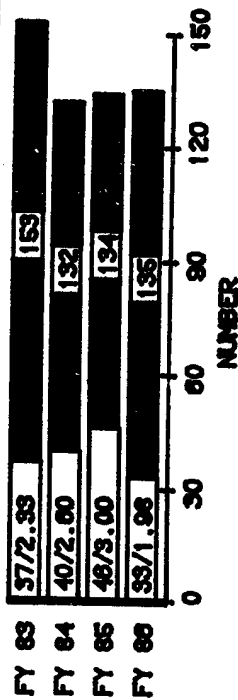
TACOM safety of use message for a one-time inspection of all M113 vehicles to ensure they were equipped with the safety locking device.

TACOM message notifying units of a one-time free issue of safety lock kits for M113A1/A2 vehicles that did not have safety locks installed.

AVIATION

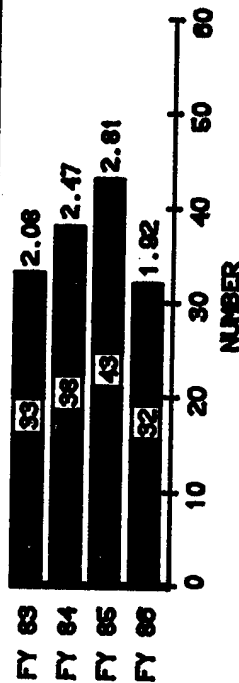
U.S ARMY AVIATION FLIGHT ACCIDENT EXPERIENCE

CLASS A, B, C ACCIDENTS



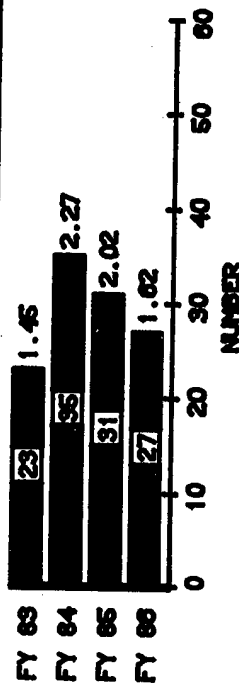
The number of Class A, B, and C flight accidents increased by 1-percent (1 accident) from FY 85 to FY 86. Class A accidents decreased by 28-percent (-13) while Class B's increased by 60-percent (+6) and Class C's increased by 10-percent (+8).
NOTE: a. Numbers in boxes at left are: numbers of Class A accidents/rates per 100,000 flying hours.
b. Numbers in boxes at right are: numbers of Class A-C accidents.

DESTROYED AIRCRAFT



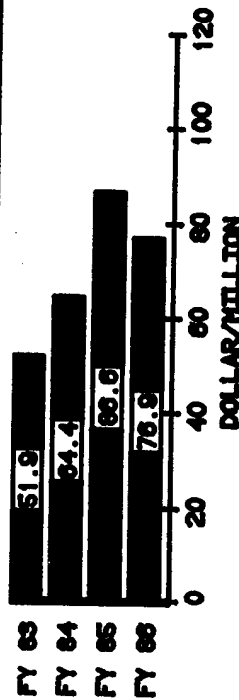
The number of destroyed aircraft reduced by 26-percent (-11). The major decreases were 50-percent in the OH-58 (-6) and the UH60 (-3).
NOTE: a. Numbers in boxes are: numbers of destroyed aircraft.
b. Numbers at ends of bars are: rates per 100,000 flying hours.

FATALITIES



The number of fatalities reduced by 13-percent (-4). No Army civilian fatalities occurred in FY 86 compared to one in FY 85. There were 11 accidents resulting in Army fatalities in both FY 85 and 86. One accident in FY 86 resulted in eight fatalities compared to one with twelve fatalities in FY 85.
NOTE: a. Numbers in boxes are: fatalities.
b. Numbers at ends of bars are: rates per 100,000 flight hours.

CLASS A, B, C COST



The rising trend in aviation costs reversed in FY 86 with a 11-percent (\$9.7M) reduction from FY 85. The decrease is primarily attributed to a reduction in UH60 losses.
NOTE: Numbers in boxes are: millions of dollars.

CLASS-A RATES PER 100,000 FLYING HOURS

ARMY AVIATION FLIGHT ACCIDENT ANALYSIS - FY 86

<u>Aircraft Type</u>	<u>Number of Class A,B,&C Accidents</u>	<u>Total Cost</u>
UH1	37	13.0M
AH1	22	13.1M
OH58	17	2.9M
TH55	9	0.4M
CH47	8	7.2M
UH60	6	15.3M
U21	6	0.2M
AH64	5	21.2M
C12	5	0.4M
CH54	4	0.3M
OH6	4	0.2M
OV1	3	0.1M
T42	3	0.1M
AH6	1	0.1M
HU5	1	0.5M
MH6	1	0.5M
RG8	1	1.2M
RV1	1	<0.1M
T41	1	<0.1M
TOTAL	135	76.9M

AVIATION

PROBLEM AREA: Human Error.

Inadequate flight planning, improperly divided attention, inaccurately estimated clearance/closure; improperly monitored performance of personnel; failed to follow procedures.

PRINCIPAL CAUSE FACTOR: Inadequate Self-Discipline (47%)

Inadequate self-discipline consists of personal characteristics such as overconfidence or improper attitudes toward job requirements that cause individuals to commit task errors that cause accidents. Examples specific to FY 86 are:

- Decisions to perform flight maneuvers that exceed aircraft capabilities because of overconfidence in flying ability.
- Decisions to violate flight altitude restrictions because of overconfidence in flying ability.
- Decisions to conduct unauthorized missions because of excessive motivation.
- Decisions not to conduct a detailed FOD check prior to and after installation of engine part.
- Decisions to perform a type of flying not qualified for and that exceeds aircraft and personal capabilities because of overconfidence in flying ability.
- Decisions not to perform required aircraft performance checks. Aviator then flew into conditions that exceeded aircraft performance capabilities because of improper attitude toward regulations which direct such performance checks.
- Decisions not to perform required mission planning tasks for hazardous flight because of overconfidence in flight crew ability to overcome any problems encountered.

COUNTERMEASURES:

Unit level actions.

PRINCIPAL CAUSE FACTOR: Inadequate Unit Training/Experience (16%)

Unit training/experience are inadequate when personnel perform accident-causing behaviors because unit training or supervised on-the-job experience provided did not prepare them to perform assigned tasks properly. Examples specific to FY 86 include:

1. Aviators were assigned to fly in adverse climatic and flight conditions when not current in the type aircraft or proficient in the maneuvers required to complete the flight.
2. Newly assigned aviators with minimal flight experience, little proficiency and none of the required continuation training, required at unit level were assigned to fly NOE flight in a hazardous environment during field training exercise.
3. Untrained aviators were assigned to perform maintenance checks on aircraft.
4. Untrained crew chiefs were assigned to perform unit aircraft maintenance tasks.

COUNTERMEASURES:

Cargo Helicopter

USAAVNC will include Night Vision Goggles (NVG) qualification in the CH-47D Aircraft Qualification/Instructor Pilot Course starting in FY 88.

USAAVNC started a CH-47 Flight Engineering Instructor Course. Graduates are awarded ASI and will become unit instructors in the conducting of enlisted crewmember standardization training.

Unit level actions.

PRINCIPAL CAUSE FACTOR: Inadequate Maintenance (9%)

Maintenance is inadequate when it causes or contributes to an accident-causing personnel error or materiel failure/malfunction. Examples specific to FY 86 include:

- Required inspections for FOD in engine were not performed.
- Failed to inspect and detect improperly installed aircraft part.
- Installed a defective part on aircraft.
- Failed to inspect and detect damage to aircraft caused during maintenance work.
- Failed to inspect and detect corrosive material left on critical part during maintenance.

COUNTERMEASURES:

Unit level actions.

PRINCIPAL CAUSE FACTOR: Inadequate Written Procedures (6%)

Inadequate written procedures are those written, unwritten-but-understood, or nonexistent procedures for normal, abnormal, or emergency conditions which lead to or allow accident-causing behaviors or materiel failures/malfunctions. Examples specific to FY 86 include:

a. Army level.

- AR 95-1 (Tab 8A) and STACOM 87 (Tab 8B) state that pilots will be trained for maintenance operational checks (MOC) per TM 55-1500-328-25. However, this TM provides no training guidelines for qualifying personnel to perform MOCs.
- AF-64 operator's manual does not address the potential hazard of inadvertent activation of the engine chop control while in flight.
- RU-21 H operator's manual checklist for starting engines does not instruct pilots to monitor operating engine temperature. Also, it does not specify actions to take in the event of engine overtemperature during starting process.
- Special Forces Air operations FM 31-24 provides no guidance for helocasting operations; i.e., optimum airspeed and altitude, safety equipment for jumpers, and communications between aircraft crew and jumpmaster.
- TM 55-1520-236-23 does not provide specific information on engine speed for adjustment of N2 rigging during ground run.

b. Unit level.

- Unit SOP does not require engine air particle separator air inlet covers to be installed during flight operations.
- Unit has no established procedures to comply with DA directives regarding command approval and briefing updates associated with night mission changes.
- Unit SOP contains inadequate guidelines regarding how multiship operations should be accomplished.
- Unit SOP contains inadequate procedures for jump-abort or go-around during helocasting operations.
- Unit has no written maintenance shop SOP.

COUNTERMEASURES:

Utility Helicopter

U.S. Army Safety Center (USASC) recommends TRADOC develop guidance for helocast operations.

Attack Helicopters

USASC issued a Hazard Alert message advising field units of the need to brief nonqualified passengers in the AH-64 on the engine chop collar. Additionally, USASC recommended to AVSCOM that the operator manual be changed to include a warning on the chop collar.

All Aircraft

USASC issued a Hazard Alert message advising the field units of the need to relook and revalidate airtraffic routing and control to/from training areas and within cantonment areas to preclude traffic conflict (midair collisions).

USASC issued a Hazard Alert message advising field units that the AN/APN 209 Radar Altimeter should not be used as a terrain avoidance radar. Rather, it should be used in conjunction with visual cues when flying close to terrain.

USASC continually participates in aircraft operators' and maintenance manual reviews. Additionally, many doctrinal and training manuals are reviewed for safety considerations.

USASC initiated action to develop standard hazard altitude marking symbology for maps Armywide.

Unit level and higher level actions.

PRINCIPAL CAUSE FACTOR: Inadequate Supervision (6%)

Supervision is inadequate when it leads to or allows accident-causing behaviors or material failures/malfunctions. Examples specific to FY 86 include:

- Unit maintenance supervisor allowed nonstandard maintenance shop training and improper maintenance procedures, including lack of written shop SOP and tool accountability.

- Operations officer failed to brief unit prohibitions against practice autorotations.

- IC0 allowed untrained individual to occupy seat with access to flight controls during aircraft operations.

- IC0 failed to ensure the adequacy of policies regarding multiship operations and failed to ensure that assigned personnel were familiar with and followed unit policies.

- Squadron chain of command failed to ensure pilot received proper training before being assigned to FTX.

- Maintenance supervisor signed checklist as completed but failed to notice action taken block was not completed.

COUNTERMEASURES:

Unit level and higher level action.

PRINCIPAL CAUSE FACTOR: Equipment/Materiel Improperly Designed/Not Provided (38)

Equipment/materiel is improperly designed when it causes or allows personnel behaviors or materiel failures/malfunctions which, in turn, result in accidents. This category also includes accidents caused by failure to provide equipment/materiel. Examples specific to FY 86 include:

- U21 landing gear system does not allow main gear to function if nose gear has failed. Failure of one landing gear system causes all landing gear systems to fail.
- Machine screw securing pressure side hydraulic plate of prop control can vibrate loose during ground testing of RVLD and enter the running engine because it is a nongrip screw used without safety wire.
- Engine chop control on the AH-64 is not identified with caution/warning labels. It can be confused with the collective function control and inadvertently activated.
- AN/PVS-5A night vision goggles were designed for ground use, not for air operations in low-level illuminations environments, in which they do not provide adequate visual acuity, depth perception, and peripheral vision for safe flight operations. The AN/AVS-6 design is somewhat better for aviation operations, but fielding has been slow.

COUNTERMEASURES:

Attack Helicopters

Product improvement proposal (PIP) approved for redesign of the AH-1 swashplate assembly to provide increased bearing endurance life and safety.

USASC recommended AMC study benefits of installing wire detection devices on helicopters.

PIP approved to install a device on the AH-1 which provides a warning to pilots of low G conditions which are conducive to mast bumping and also provides advance warning of exceeding power available and materiel failures in the T53 engine.

USASC recommended to AMC that the AH-64 tail wheel structure be redesigned to withstand continuous high impact loads resulting from touchdown autorotations.

USASC recommended to AMC the relocation of the shoulder harness locking lever for the AH-64 CPG and pilot so as to provide accessibility during flight.

PIP approved of the AH-64 for a visor which will provide crewmembers with ocular protection and safety against laser radiation and ballistic fragments.

PIP approved to install wire strike protection system on the AH-64 to provide enhanced survivability for the aircraft and crew when mission requires low level flight.

Cargo Helicopters

Safety-of-Flight message CH-47-85-19 requires a visual inspection of the vertical hinge pins for cracks in CH-47C and D helicopters.

Safety-of-Flight message CH-47-85-20 required an eddy current inspection that would positively identify defective pins.

USASC recommended to AMC that CH-47C units be authorized to order and install the CH-47D glare shield to improve NVG cockpit compatibility.

USASC recommended that AMC investigate the problem of short supplies of 250-watt searchlight bulbs.

Engineering Change Proposal approved for improved heat resistance of the flight control system bellcranks and control rods of the CH-47D as an immediate safety fix, while other actions are under

evaluation to improve aircraft survivability following inflight fires in the combiner and engine transmission areas.

Engineering Change Proposal approved to install a ring guard around the hook release buttons on the CH-47 cyclic and hoist operators' grips to help prevent unintentional jettisoning of external loads.

Engineering Change Proposal approved to install a single handle cargo hook release system that will allow all three hooks on the CH-47D to be manually opened when activated.

Observation Helicopter

Safety-of-Flight message issued for OH-6 and OH-58 aircraft equipped with the T63-A700 engine restricted to minimum altitude of 400' AGL and no passengers in rear compartment. Message is a result of inflight catastrophic engine failures.

Safety-of-Flight message issued required removal of MILES equipment from OH-58 aircraft. The MILES cockpit kill indicator was found to restrict vision of both the pilot and copilot, and vibrations created by the aircraft kill indicator mounted on the landing gear caused cracking of the aft crosstube.

Safety-of-Flight message issued for the OH-6 aircraft required rework of the tail rotor blades to remove abrasion strips. The message was a result of three accidents in which loss of an OH-6 tail rotor abrasion strip resulted in tail rotor gear box separation.

PTP has been developed to replace the T63-A-700 engine in the OH-6 fleet. Replacement with the T63-A-720 engine will standardize the propulsion system of the observation helicopters, thereby providing both increased reliability and supportability and reducing many of the safety-related problems of the T63-A-700 engine.

All Aircraft

USASC recommended that AMC expedite fielding of the ANVIS 6 night

vision goggles, and continue research to improve the peripheral vision and small object detection of NVG.

ADDITIONAL AVIATION ACCIDENT PREVENTION EFFORTS

In addition to countermeasures developed, targeted, and implemented for specific cause factors, some generic activities continued or were initiated in FY 86 which impacted on more than one of the cause factors defined herein.

- a. The Army Research Institute (ARI), in conjunction with the U.S. Army Aviation Center and the U.S. Army Safety Center, continued to develop a plan of attack for the "Army Strategy for Reducing Pilot Error" study. The primary focus of the study is directed at pilot decision-making abilities and situational awareness.
- b. Safety-of-Flight (SOF) messages have been issued on all aviation systems ranging from extended groundings to one-time part inspections. SOF messages were developed by the U.S. Army Aviation Systems Command (AVSCOM), and reviewed by the USASC, and coordinated on by HQDA staff elements. The instigating sources of SOFs are usually Quality Deficiency Reports (QDR) or accident board findings.
- c. A brochure, entitled "Aviation Units Safety Records: What Makes the Difference?" was published by the USASC. This publication provides actions for virtually every problem area which commanders can influence in reducing aviation accidents in their units.
- d. The cornerstone of aviation accident awareness continues to be FLIGHTFAX. Significant preliminary reports of aircraft mishaps (PRAM) are published in F/F weekly so as to inform the field of problem areas. Additionally, a Class A case is reviewed in detail to point out mistakes and deficiencies.
- e. At the direction of the Chief of Staff, Army, a UH-60/AH-64 Evaluation Group was formed to accomplish system assessments of the two new aircraft. A subgroup was formed for each system with membership from the materiel development, training, logistics and safety communities as well as DA staff elements. Many issues, ranging from production/design to operational employment have been

identified for pursuit and resolution. Included in this spectrum of issues are those which will cut across problem areas identified herein.

- f. The Chief of Staff, Army, directed the procurement and installation of flight data recorders (FDR) for UH-60 and AH-64. Decisions on procurement of additional FDRs for other aircraft will be made in the future.