Chapter

10

National Defence

In-Service Equipment

The audit work reported in this chapter was conducted in accordance with the legislative mandate, policies, and practices of the Office of the Auditor General of Canada. These policies and practices embrace the standards recommended by the Canadian Institute of Chartered Accountants.

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National Defence
In-Service Equipment

Main Points

10.1 The Canadian Forces spend about 20 percent of an $11.2 billion defence budget to manage, repair, and maintain military equipment. About $1.5 billion of this pays for the purchase of spare parts, maintenance, and repairs; about $900 million represents the pay of roughly 15,000 military personnel who manage and support in-service equipment.

10.2 Officials told us that management had decided to reduce the readiness levels of Canadian Forces equipment because of budget constraints and because the international situation no longer warranted high levels of readiness. Although officials said that the reductions had been carefully controlled, we found the following:

- National Defence has not established an adequate system that defines standards and goals for equipment readiness or availability, and there is no unified reporting system to collect this information.
- The Canadian Forces do not complete, file, or analyze post-exercise reports on 60 percent of the exercises they conduct, nor are post-operation reports always completed, filed, and analyzed. This makes it hard to assess both the causes and the impacts of equipment availability problems.
- Data needed to track and manage equipment availability are incomplete, often inaccurate, and sometimes not compiled in the same way. This makes it very difficult—if not impossible—for management to know the true state of its major equipment platforms.

10.3 The Department has too few maintenance personnel to fully staff operational units and major maintenance depots. Equally serious, about 15 percent of its maintenance people lack the qualifications their ranks require. In addition, maintenance personnel lack much of the specialty training required in their units.

10.4 Nevertheless, the Department has been able to operate naval vessels at a more or less constant level of activity since 1995. The Army has been able to meet the increased demands of peacekeeping and peace support, almost doubling the use of its wheeled combat vehicles. The Air Force, however, has reduced its activities substantially, due mainly to budget reductions and the declining need for high readiness.

10.5 The armed services have set a variety of standards and goals for equipment availability, but the degree to which they are being met is not clear. We could not determine how well the Navy maintains its warships because the data were not available. The Army has kept the serviceability of

equipment in its operational units at close to an informal minimum standard of 75 percent, with no noticeable decline in availability. The Air Force has experienced low levels of equipment availability in the last five years, and availability of the Hercules and the Aurora fleets continues to decline.

10.6 The supply system can normally deliver parts within a 30-day deadline, meets about half of 7- to 14-day deadlines, but rarely meets urgent requirements. Its level of service has been constant since 1995. Except in a few specific cases, our audit did not establish a correlation between the availability of spare parts and the availability of equipment to support operations.

10.7 In operations conducted to date, equipment availability has been adequate overall. In certain fleets, however, a frequent, recurring lack of serviceable equipment has hampered military training and operations. Departmental initiatives are under way, such as the Materiel Acquisition and Support Information System (MASIS) and Canadian Forces Supply System Upgrade (CFSSU); officials expect them to improve the management of in-service equipment and contribute to enhancing equipment serviceability and availability.

The Department has responded. Overall, National Defence agreed with our findings. The Department told us it would take steps to improve readiness information systems and data quality. It also said it was working to close gaps in training and to improve the supply of spare parts to deployed units.

Introduction

Budget limitations have contributed to reduced readiness goals

10.8 In his February 2001 Report to the House of Commons, Reflections on a Decade of Serving Parliament, the outgoing Auditor General wrote that Defence program "affordability has been a major problem since the middle of the 1990s." The "multi-purpose, combat-capable" force called for in the federal government's 1994 Defence White Paper was not fully defined. As a result, with successive budget cuts every service and branch of the Canadian Forces has tried to perpetuate itself in an ever-leaner version. In spite of recent corrective measures, the effects of trying to maintain a force too large for its budget will last for several years.

10.9 National Defence can change the readiness of military units in order to stay within its budget. The challenge for the Department is to translate policy into a force structure within fixed budget limits.

10.10 In 1999, the Navy became the first service to apply a strict interpretation of Canada's minimum defence requirements to its operations and activities. It acknowledged that previous levels of readiness were no longer justified, given current global and political conditions, and were not sustainable at present funding levels. The Air Force carried out a similar exercise in May 2000, and the Army in April 2001. The Army's exercise aims to produce a sustainable Army by 2004.

10.11 In spite of the government's decision to invest around $2.4 billion more in defence from 1999–2000 to 2001–02, departmental plans indicate a budget shortage of $1.3 billion for 2001–02. The Department is reviewing its budget for the coming years. National Defence spent about 19 percent of its 2000–01 budget on new capital assets, including equipment. The Department continues to increase capital spending toward an interim goal of 21 percent in 2004–05 and an ultimate goal of 23 percent.

10.12 Our 1998 Report chapter, National Defence—Equipping and Modernizing the Canadian Forces, reported that to meet its estimated needs for new equipment over the next five years, the Department would have to almost double its planned spending on equipment, from $6.5 billion to $11 billion. In response to that chapter, departmental officials said that "hard choices may have to be made." Force reductions and reduced military readiness were possibilities. For example, a June 1998 Air Force study concluded that the strategic capital plan did not provide for enough money to modernize all the core combat capabilities of the Air Force. It cited the upgrading of the CF–18 Hornet and the Aurora for immediate attention.

10.13 Recent initiatives have not generated the savings the Department had forecast. Our December 2000 follow-up on defence support productivity found that the Department had yet to complete the efforts begun in 1994 to transform itself into a more entrepreneurial organization. Because of massive changes in the support organization and processes, we could no longer

measure productivity; nor could the base and wing support managers tell us whether they were more or less productive than in 1996.

10.14 Our 1999 audit of the federal government's alternative service delivery arrangements noted unconfirmed estimates by National Defence that its use of such arrangements had saved it about $68 million per year. However, the Department had projected in 1996 that annual savings would reach $200 million by 1999. Based on estimated results, it has revised this projection to $175 million a year by 2004.

10.15 Managing the in-service equipment fleets of National Defence is complex and expensive. In 2000–01, the Department spent about 20 percent of its $11.5 billion expenditure to manage, repair, and maintain military equipment. About $1.3 billion of that was for spare parts, maintenance, and repairs; about $0.9 billion covered salaries and benefits of roughly 15,000 military employees who manage and support in-service equipment. National Defence also spends about $2 billion of its capital funds each year on new equipment and major upgrades of existing equipment.

10.16 The Department must ensure that it employs the right number of people with the qualifications needed to keep its fleets of equipment in service. It also contracts out some of its maintenance and support work to ensure that its fleets are available for operations. Spare parts must also be available and delivered when they are needed to ensure that the maintenance workers and technicians can keep fleets operating.

Focus of the audit

10.17 Our audit focussed on the adequacy of personnel and spare parts for equipment maintenance. We used available information to analyze trends and determine whether maintenance has kept equipment available for the day-to-day operations of the Canadian Forces. We also assessed the impact of maintenance problems on collective training and exercises and on international operations. Further details on the audit are in About the Audit at the end of the chapter.

Observations

Equipment status and trends

10.18 The objective of the equipment support functions of the Canadian Forces and the roughly 15,000 military personnel in maintenance trades is to keep the equipment of the Canadian Forces ready for use. We examined data on the ships, vehicles, and aircraft that the Canadian Forces consider most important to their military operations. We looked at three trends in these important weapons platforms:

- **Activity rates**. The rate of activity is important when evaluating the success of equipment support functions in reaching availability objectives. If equipment is seldom used, having it ready much of the time is not a major accomplishment. However, low activity rates could indicate that equipment is not available for use because of inefficient support.

- **Ability to maintain equipment in service**. Our goal was to establish how successful Defence support functions were in meeting their equipment availability objectives. We use availability and serviceability interchangeably in this chapter, unless otherwise specified. These terms are used to indicate the ability of equipment to perform its intended functions.
- **Level of maintenance effort.** We were concerned that the aging of equipment might be rapidly increasing the maintenance effort needed to keep it available. We therefore examined trends in maintenance levels.

Except for the Air Force, activity rates have been maintained

10.19 To determine activity rates of the equipment fleets we selected for audit, we used sea days as the measure of naval activity, kilometres put on army vehicles, and yearly flying hours for aircraft (flying hours are measured from the time an aircraft starts to move under its own power until it stops).

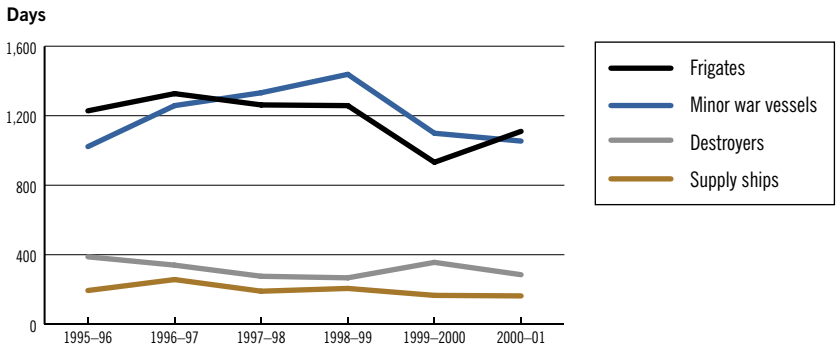
10.20 **Navy.** We reviewed the annual days at sea by class of ship, and found for the period 1995–96 to 2000–01 that activity rates were relatively constant (Exhibit 10.1).

10.21 **Army.** Data from 1989 to 1998 were available to assess activity rates of army vehicles. In that period, the Army maintained the activity rates of its key vehicles and increased the use of some. Since 1996, operations have increased the overall use of two key armoured vehicles—the Bison and the Grizzly. In 1996, for example, Grizzly vehicles in Bosnia–Herzegovina averaged about three times the kilometres averaged in the Grizzly fleet as a whole. The Coyote's use has increased since 1996 as the vehicles have been delivered (Exhibit 10.2).

10.22 Use of the medium logistic vehicle wheeled (MLVW) declined from 1989 to 1995 as the heavy logistic vehicle wheeled (HLVW) was introduced (Exhibit 10.3).

10.23 Overall, the Army maintained or increased the use of its key vehicles during the period we studied.

Exhibit 10.1 **Annual days at sea, by class of ship**



Source: Director General, Maritime Force Development

10.24 **Air Force.** Air Force activity has declined significantly since 1990, and steadily since 1995 (Exhibit 10.4). Budget reductions and lower requirements for readiness appear to be the main reasons, and not maintenance problems.

Navy ships

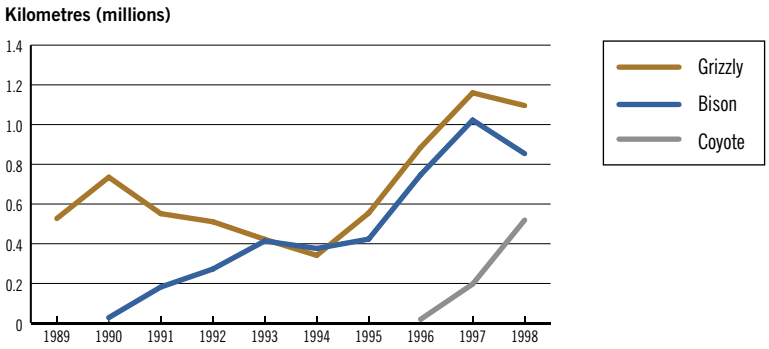
Destroyer

Iroquois class destroyer. A helicopter-carrying, command and area air defence vessel with anti-submarine warfare capabilities. These vessels support an embarked senior officer in tactical command of a national or allied task group of ships and aircraft. The two naval task groups located on East and West coasts are built around these ships. Quantity: 4. Date of purchase: 1970 and 1971.

Frigate

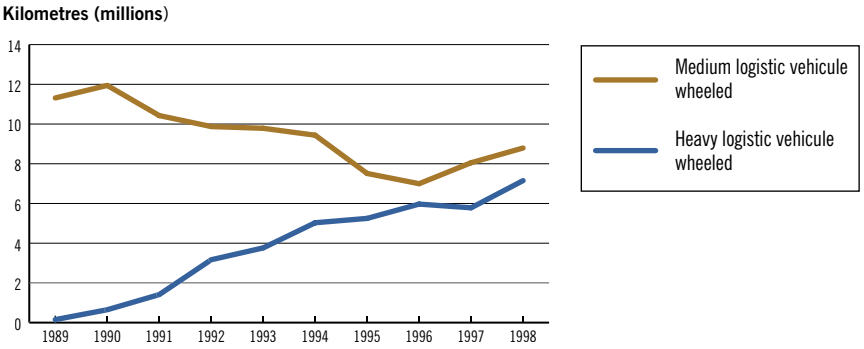
Halifax class frigate. Canadian designed helicopter-carrying vessel. It combines traditional anti-submarine capabilities with systems to deal with surface and air threats. It is the work horse of the naval task groups. Quantity: 12. Date of purchase: 1992 to 1996.

Exhibit 10.2 **Bison, Coyote, and Grizzly—Total kilometres driven**



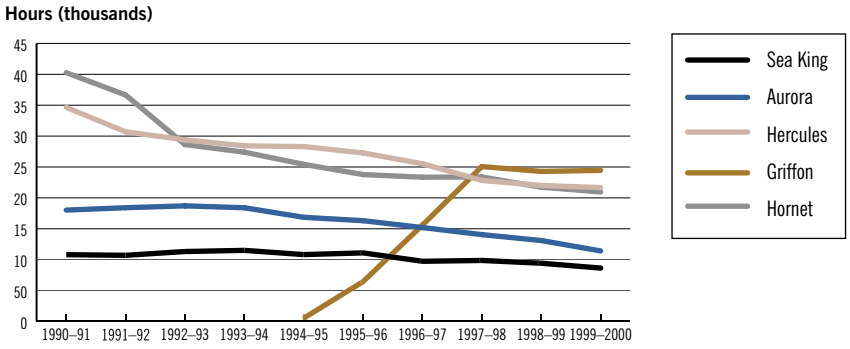
Source: Performa—Equipment

Exhibit 10.3 **MLVW and HLVW—Total kilometres driven**



Source: Performa—Equipment

Exhibit 10.4 **Annual flying hours, by Air Force fleet**



Source: Performa—Air

Problems in keeping equipment in use

Navy ships

Supply ship

Protecteur class operational support ship. Supply ships replenish naval task groups at sea with food, munitions, fuel, spare parts, and other supplies. Their large capacity and extended range enable naval task groups to stay at sea longer and go farther. Quantity: 2. Date of purchase: 1968 and 1969.

Maritime Coastal Defence Vessel

Kingston class ship. Minor war vessel, whose primary mission is coastal surveillance. It is equipped to carry various payloads: minesweeping, route survey, or bottom object inspection. It offers an economical alternative to major surface ships for routine coastal patrol. The vessel's crew is composed primarily of naval reservists; however, two Regular Force technicians augment each of the twelve crews. Quantity: 12. Date of purchase: 1995 to 1998.

10.25 We expected that each armed service would have goals or standards for equipment availability based on its operational and training needs. We also expected that each service would monitor its maintenance efforts to ensure that equipment was neither overmaintained nor undermaintained.

10.26 **Navy.** While the Navy has the raw data, it does not compile statistics on the availability of its key systems. Major deficiencies in systems on board ships are reported as they occur, through the operational deficiency reporting system. We focussed on deficiencies that affected combat capability, safety, or immediate operations.

10.27 The annual rate of operational deficiencies per sea day was significantly higher on the East coast from 1997–98 to 1999–2000 than on the West coast—indeed, more than twice as high in 1999–2000. Navy officials indicated that differences in operations, climate, weather, and sea states are some of the factors that could contribute to the disparity between coasts. On average, the time it took to correct the deficiencies decreased during that period, on both coasts. Officials on the West coast attributed the decrease there to a major change in the focus of operations. Ships have had to perform more high-profile missions, making the timeliness of repairs more critical.

10.28 **Army.** Overall, the Army has kept equipment readiness levels at or near informal goals most of the time, although in some brigades the HLVW and Bison show some decline. Generally, equipment has been available for operations at more-or-less-constant levels since 1989.

10.29 At the brigade level, serviceability has fluctuated from month to month since 1995. Most of the time, it met an informal standard of 75 percent, the lowest brigade goal. However, we did note a significant decrease—between 6 and 15 percent—in the serviceability of the HLVW in brigades. At 5 Canadian Mechanized Brigade Group we found that the serviceability of the Bison had decreased 27 percent.

10.30 We also reviewed the serviceability of vehicles used in Bosnia–Herzegovina, Kosovo, and Eritrea and found no significant trends. The Department explained that serviceability rates below 90 percent, the informal goal, were likely accounted for by inspection schedules, problems in getting spare parts for the HLVW, and failures of parts in the MLVW, Coyote, Bison, and Grizzly fleets.

10.31 The Department calculates an annual rate of vehicle availability to show the percentage of time that vehicles were available and not down for maintenance. This operational availability rate is calculated for the vehicles in service that have had some maintenance at some time during the year. Given that data for 1999 and 2000 were incomplete, we looked at data from 1989 to 1998.

10.32 During that period, operational availability of both the HLVW and the MLVW fleets stayed above 80 percent, although the MLVW's availability was lower than in previous years. The Grizzly fleet's availability fluctuated, remaining below 80 percent except in 1996. The Bison was available more often than the Grizzly, fluctuating between 75 and 84 percent. In the newer

Army vehicles

Bison

The Bison is a wheeled armoured vehicle acquired under the MILAV (Militia Light Armoured Vehicle) project for reserve force training, primarily as an infantry section carrier, with command post and mortar kits and a vehicle repair variant. It has been adapted for use by the Regular Force with additional ambulance, engineer, and mortar variants built since acquisition. Quantity: 199. Date of purchase: 1990 to 1992.

Coyote

The Coyote is a wheeled armoured reconnaissance vehicle used in surveillance missions at the battle group and brigade levels. Quantity: 203. Date of purchase: 1996 to 1998.

Grizzly

The Grizzly is a wheeled armoured vehicle whose primary use is to provide mobility and protection for an 11-person infantry section. Quantity: 265. Date of purchase: 1976.

Coyote fleet, only 43 vehicles were active in 1996. In 1998, when most Coyotes were in service, the fleet's availability rate was 85 percent.

10.33 The semi-annual inspection is an important preventive maintenance activity to detect and fix problems before they get worse. It also determines the general condition of the vehicles in a fleet. The Department is having difficulty keeping up with inspections.

10.34 Using the statistics available for January 1995 to March 2001, we compared rates of inspections outstanding with the goals for inspections outstanding. (Statistics for 1 Canadian Mechanized Brigade Group were not available.)

10.35 We found that the two brigades we looked at are not meeting their respective goals; their availability rates have fluctuated over time. We compared the actual rates with the lowest goal for inspections outstanding, 20 percent or less. In the five fleets we considered at 5 Canadian Mechanized Brigade Group, this goal was met 61 percent of the time. In 2 Canadian Mechanized Brigade Group, it was met 38 percent of the time. More on-time inspections could improve the serviceability of vehicles in the long run.

10.36 **Air Force.** The Air Force calculates operational availability as total time minus downtime for maintenance. The figures are expressed as percentages and are based on a 24-hour day. The Air staff stopped producing reports on operational availability in 1999 because of Year 2000 problems in the information systems used to manage the data.

10.37 From April 1995 to October 1998, all fleets except the Griffon were available for operations only 30 to 60 percent of the time.

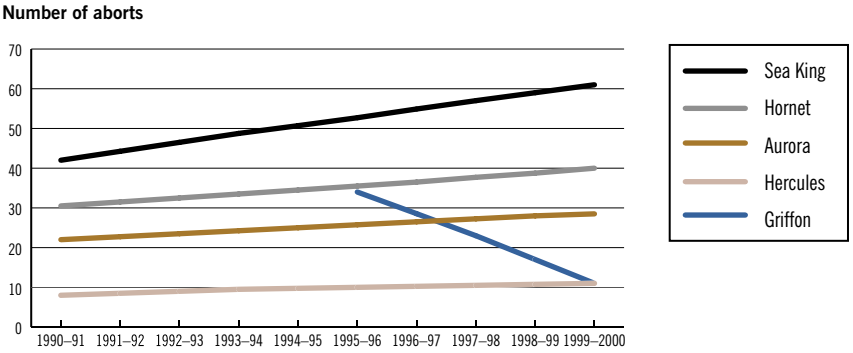
10.38 Data on the Hercules fleet show a downward trend after October 1998. Availability of the Aurora fleet declined from about 55 percent to 42 percent. The Sea King fleet's availability declined from about 42 percent to 29 percent; departmental officials estimated that about half of that decrease was due to downtime for several aircraft modifications and other avionics upgrades, and the rest was for repairs to keep the fleet airworthy.

10.39 Availability of the Griffon fleet increased between April 1995 and October 1998, from about 70 percent to 78 percent. Departmental officials explained that the rate increased as employees gradually acquired competence in operating and maintaining the aircraft.

10.40 Abort rates represent the total number of suspected failures per 1,000 flying hours that result in cancellation of a mission. We found that from 1990–91 to 1999–2000, abort rates increased in all fleets except the Griffon helicopter. Our analysis found that except in the Aurora fleet, all the increases were significant: between 30 and 60 percent (Exhibit 10.5).

10.41 Overall, availability of the aircraft most important to Air Force operations has been low over the last five years and is still declining in the Aurora and Hercules fleets. This is probably due to reduced funding and the aging of equipment. Three fleets are due for major overhaul and rebuilding, and one is due to be replaced.

Exhibit 10.5 **Abort rates per 1,000 flying hours, by Air Force fleet**



Source: Performa—Air

The Navy and the Air Force need greater equipment support effort

Army vehicles

Heavy logistic vehicle wheeled (HLVW)

The HLVW is a large truck. Ten variants of this vehicle provide support to the land forces. Quantity: 1,208. Date of purchase: 1992.

Medium logistic vehicle wheeled (MLVW)

The MLVW is a truck used throughout the battlefield in such roles as command and control, troop and cargo transport, and maintenance and administrative functions. Quantity: 2,769. Date of purchase: 1982.

10.42 It is important to know not only whether equipment support functions are reaching their goals but also whether reaching them takes more effort. We therefore looked for trends in the amount of work required to keep equipment available.

10.43 **Navy.** The Navy has maintained its activity rates. Lack of data meant we could not determine the maintenance effort required to achieve these activity rates, but it appears that a maintenance backlog is building.

10.44 In October 2000, the Chief of the Maritime Staff discussed the growing "bow wave" of deferred maintenance. Preliminary studies and analyses have pointed to a backlog. According to their maintenance profiles, Halifax class vessels are supposed to have a total of 12 weeks scheduled each year for corrective and preventive maintenance. But they averaged only 6.1 weeks in 1997, 7.8 weeks in 1998, and 8.7 weeks in 1999. A recent study of the maintenance hours worked by crew on one of the Halifax class ships indicates that ship crew do not have enough time to complete all preventive maintenance routines. A comparison of the maintenance hours that are required with the hours available for maintenance shows that maintenance capacity on Halifax class ships cannot keep up with the required standard. Preliminary data on Maritime Forces Atlantic indicate that the Halifax and Iroquois fleets have significant amounts of maintenance still waiting to be done.

10.45 Several recent decisions have addressed the bow wave of deferred maintenance. For example, Navy headquarters has renewed its Halifax class long-term maintenance review. All deferrals of preventive maintenance are to be tracked, and staff have been encouraged to help with accurate recording of maintenance data. As noted by the Chief of the Maritime Staff, "Chronic deferral of preventive maintenance prejudices not only current availability but also the life expectancy of the ship."

Air force aircraft

CH–124 Sea King

The Sea King is a ship-based helicopter carried on board destroyers, frigates, and supply ships. Its primary role is anti-submarine warfare, but it is also used for search and rescue and utility transportation. Quantity: 29. Date of purchase: 1963 to 1969.

CC–130 Hercules

The Hercules is used to airlift troops, equipment, and cargo in search and rescue operations and in air-to-air refuelling of CF–18 Hornet fighter aircraft. Quantity: 32. Date of purchase: 1964 to 1997.

CP–140 Aurora

The Aurora is a long-range patrol aircraft used for land and sea surveillance and for anti-submarine warfare. Quantity: 18. Date of purchase: 1980–81; 1992–93.

10.46 **Army.** The Army appears to have maintained and even increased activity rates between 1989 and 1998 without increasing its maintenance efforts. It has not seen any noticeable decline in the availability of equipment fleets, although readiness has fluctuated in operational units.

10.47 We compared maintenance hours for Army vehicles with vehicle usage by looking at the Department's performance indicator, in-house maintenance hours per 100 kilometres. We found that this measure fluctuated and there were no obvious trends in any of the five fleets.

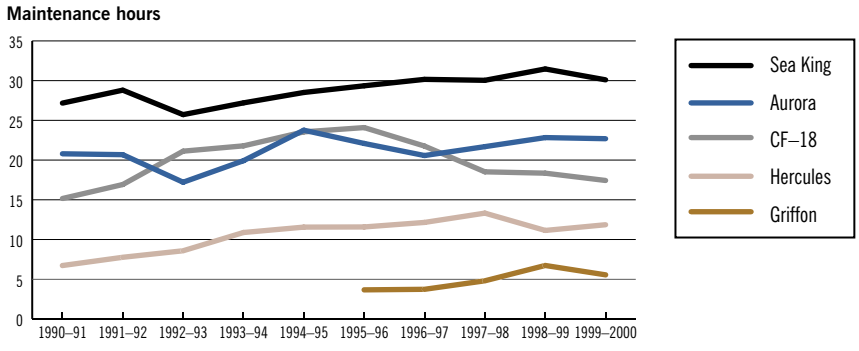
10.48 Although most vehicles have been in service for a long time, generally the ratio of maintenance hours to kilometres is not increasing. However, total maintenance hours are increasing significantly in all fleets except the MLVW, where they have decreased, and the Grizzly, where they have fluctuated.

10.49 **Air Force.** The Air Force has significantly reduced its activity, and its ability to keep equipment available has declined.

10.50 For the Hercules and the Sea King, the two oldest fleets, we found significant increases in the ratio of total maintenance hours to flying hours from 1990–91 to 1999–2000, namely, 62 percent for the Hercules and 16 percent for the Sea King. In the Hercules fleet, corrective maintenance accounted for most of the increase. Even though the Hercules flew about 37 percent less in 1999–2000 than in 1990–91, total hours of corrective maintenance increased about 26 percent; the ratio of corrective maintenance hours to flying hours doubled (Exhibit 10.6).

10.51 Departmental officials attribute the increase in maintenance of the Hercules and the Sea King mainly to the aging of the fleets. Other factors were the loss of expertise in aircraft maintenance due to the military force reduction program in the mid-1990s, and the amalgamation of aviation technician trades, also in the mid-1990s.

Exhibit 10.6 **Annual maintenance hours per flying hour, by Air Force fleet**



Source: Performa—Air

Maintenance personnel

Providing maintenance personnel has become problematic

10.52 National Defence employs about 15,000 military personnel in 36 military maintenance occupations to service major equipment of the Canadian Forces. We did a comprehensive analysis of military maintenance personnel in 49 operational units and large maintenance depots. We included the 202 Workshop Depot in the Army analysis; although it is part of the Materiel Group, it is the major land vehicle depot. Our analysis identified significant shortages of personnel and a lack of qualified staff.

10.53 The Department estimates that the armed forces are having critical difficulties staffing 18 of the 36 military maintenance occupations. In some cases, these occupations are at 10 percent or more below staffing targets; in other cases, the Department estimates that recruitment and training will not be sufficient to reach staffing targets before 2003. Departmental projections also indicate that for the next year or two, eight additional maintenance occupations will be staffed at 5 to 10 percent below target levels.

10.54 We asked the maintenance units in our sample of 49 to identify any significant personnel shortages at 1 March 2001 and assess the impact on their exercises and operations. Overall, 13 percent of positions in the units are vacant—16 percent in the Navy, 14 percent in the Army, and 11 percent in the Air Force. Navy units reported significant shortages on the West coast in trades such as naval electronics technicians, marine engineer technicians, and maritime engineers. Army units have significant shortages of vehicle technicians, weapons technicians, materiel technicians, and fire control technicians. Air Force units cited significant shortages of aviation systems technicians, avionics systems technicians, and aircraft structure technicians. Units of the three services acknowledged that shortages have had an impact on training and operations, but they were not specific about its nature and extent. The Navy reported that it had deferred a large amount of preventive and corrective maintenance and some crew had not met some minimum requirements—sea watch keeping and weapons certification, for example. Army and Air Force units mentioned that in many cases there are enough people to fill positions, but some of them are inexperienced, untrained, or not deployable.

10.55 Many military personnel in maintenance occupations do not hold the qualifications their ranks require. We compared the qualifications required for specific ranks with the qualifications of maintenance personnel at those ranks. We found that 15 percent did not have the required qualifications.

10.56 The units in our sample require specialty training for specific positions. However, we note that military personnel in units are managed in groups; a person can be assigned to a position and not necessarily work in it. We took this practice into account. Overall, we found that military personnel had not taken 38 percent of the specialty courses required for the positions they were working in. Broken down by service, the figures were 27 percent in the Navy, 36 percent in the Air Force, and 61 percent in the Army (42 percent accounted for by a single course, military wheeled vehicle driver).

Air Force aircraft

CH–146 Griffon

The Griffon is a transport for the airlift of equipment and personnel, command and liaison flights, casualty evacuation, and logistic transport. It has limited use in search and rescue. Quantity: 99. Date of purchase: 1995 to 1997.

CF–18 Hornet

The CF–18 Hornet is a fighter jet whose primary roles include air interception, air control, and tactical bombardment. Quantity: 122. Date of purchase: 1982 to 1988.

10.57 Although they were not specific about the impact of lacking qualified personnel, units did tell us that personnel must not only be qualified but also complete specialty courses and acquire experience on the job. In some occupations, maintenance personnel may need up to two years on the job before they can work unsupervised, and another five years to qualify in a specific expertise. This apprenticeship period must be completed before they receive additional specialty courses. Units also said that along with required specialty courses, many safety-related courses—such as first aid, firefighting, and weapons training—should be prerequisites for supervisors.

There are shortfalls in staffing

10.58 To meet National Defence staffing priorities, each of the three services must staff units deployed on missions at 100 percent and operational units at 92 percent. In the sample of units we audited, the three services do not always meet the staffing targets for maintenance occupations. We found that none of the major Navy warships on the West Coast meet staffing targets. Staffing of maintenance positions on destroyers, frigates, and supply ships varies from 50 percent to 80 percent. Army service battalions in Edmonton and Petawawa are staffed at 87 percent and 79 percent respectively. Only 4 of the 10 Air Force units meet the staffing targets for maintenance positions.

10.59 Units must also meet standards of readiness. Each unit must have personnel and materiel at the levels needed to respond to White Paper tasks. The readiness of a unit is determined by its manning, equipment, and training, and must be attainable within a specific length of time. Response time is the time it takes a unit to be fully staffed and equipped to respond; this includes training time and logistics support.

10.60 Required levels of personnel readiness vary among the services. According to manning guidance provided by the Vice Chief of the Defence Staff, most Army and Air Force operational units are to be staffed at a minimum of 92 percent. In our sample of units, we found that only one of the three Army service battalions meets the goal and around 50 percent of the Air Force units fall short. The Navy is implementing its April 2000 readiness and sustainment policy, though it has not been officially approved. The new policy stipulates that ships at high readiness must be staffed no lower than 95 percent, and ships at standard readiness at about 75 percent. Ships at extended readiness are staffed only with custodial crew. We found that 5 of 13 ships at high readiness did not meet the target. But staffing on 16 of 17 ships assigned to standard or extended readiness greatly exceeded the targets.

Provision of spare parts

Spare parts are provided slowly

10.61 Keeping equipment in service requires an adequate supply of spare parts. The vast majority of spare parts are provided through the Canadian Forces Supply System. The system monitors about one million line items, including new parts purchased and used parts repaired and overhauled. The total value of the spare parts was about $10 billion in 2001. The supply system has been used since 1974 and has been undergoing a major upgrade since the early 1980s. Completion of the upgrade was scheduled for summer 2002.

10.62 We examined the extent to which the supply system provides the spare parts the Canadian Forces need when they need them—from within 30 days to within two days. Parts ordered for delivery within two days are considered an urgent requirement with an immediate impact on operations.

10.63 We examined spare parts data from 1995 to 2000 for the Navy, Army, and Air Force fleets in our audit sample (this did not include the Griffon and the Maritime Coastal Defence Vessel, which are serviced by contractors and not by the supply system). We analyzed only the demands for spare parts needed for repair or replacement; we did not look at routine restocking of inventory.

10.64 Exhibit 10.7 shows the success rate of each service in providing spare parts within deadlines to the fleets we examined. While the performance of the current supply system is low for parts needed urgently, it is consistently high for 30-day requirements. Between 1995 and 2000, the rates remained stable, despite a drop in total demand in two of the three services. Low success rates reflect the difficulty of procuring or repairing spare parts and delivering them to the needed locations under tight deadlines.

10.65 We found that over this period the Army's total demand for spare parts was constant. Demand in the Air Force declined 25 percent and in the Navy 45 percent.

10.66 Our audit did not find significant problems in the overall level of service the Canadian Forces Supply System provides. However, we did find cases where maintenance problems, including inability to obtain spare parts, created major challenges for the operations of entire fleets of equipment over long periods of time (see case studies on pages 14 and 15).

Exhibit 10.7 Success rates in providing spare parts within deadlines, 1995–2000

Deadline	Navy	Army	Air Force
2 days	34%	37%	45%
7 days	54%	44%	63%
14 days	55%	60%	72%
30 days	92%	92%	98%

Note: Success rates are weighted averages.

Source: Canadian Forces Supply System database

Examples of major repair problems

Aurora flight director indicator

Delays in management decisions severely degraded the effectiveness of the Aurora long-range patrol aircraft for over five years.

The Aurora is a long-range patrol aircraft used for maritime, arctic, and environmental surveillance; pilot training; and search and rescue. There are 21 aircraft in the fleet. The flight director indicator (FDI) on each aircraft is designed to provide a warning to the pilot when the instrument's power or aircraft attitude (wing tilt) data are interrupted. Unfortunately, the FDI does not provide a warning if the instrument suffers an internal failure. Internal failure causes the instrument display to "freeze" in its last position and it stops giving the pilot reliable information on aircraft attitude. Freezing of the FDI without a warning so the pilot can switch to backup instruments is a hazardous condition that could contribute directly to an aircraft accident.

The flight director indicator was the subject of several flight safety incidents between February 1997 and August 2000. The warning is not reliable. In 1998, an airworthiness risk assessment rated this as an *extremely high* risk, making it necessary to restrict the operations of the fleet. This precluded flying at low levels, at night, and during periods of reduced visibility, all essential to the aircraft's mission and to training. The Aurora Incremental Modernization Program (AIMP), a major avionics upgrade program, was not considered a solution to the problem because it involved a five-year delay.

In February 2001, four years after identifying the problem, the Department issued a contract to the original supplier to overhaul components and spares of all flight director indicators. The overhaul was to start by June 2001 and be completed by December 2001. All spares will be overhauled by May 2002. Based on the current inventory, 80 instruments will be overhauled at a cost of $10,000 each, for a total of $0.8 million. The flight director indicator will later be replaced under the incremental modernization project.

The Department estimated the replacement cost of the FDI at $50,000 each, or $4 million for the entire inventory.

It will have taken the Department 63 months, from the first flight safety incidents in 1997 to the scheduled completion of the overhaul in 2002, to address a relatively minor problem that severely degraded a major weapon system.

Hercules avionics update project

Inadequate planning by the Department affected the operational readiness of Hercules aircraft.

The Hercules transport fleet of 32 aircraft is used to support operational missions, including strategic and tactical airlifts and search and rescue. An avionics program to upgrade the fleet was initiated in 1994. The upgrade was carried out from 1998 to 2001. By September 1999, only 18 months after the upgrade began, all spare parts had been depleted—though only 12 of 32 aircraft had been upgraded. Three months later, the Department undertook a study to find out why.

Two factors led to the delay in acquiring needed spares: the upgrade was tailored to Canadian Forces requirements, and it involved a small number of aircraft. The Department did not foresee that these two factors would cause lengthy delays in acquiring needed spares.

It took the Department 18 months to identify the problem, and 30 months will have elapsed before all the new spares are delivered. Additional spare parts have cost just under $13 million so far. Our main concern is not the additional cost or the early depletion of spare parts but the delay, during which aircraft were not available or were less useful.

Examples of major repair problems

Maintenance problems in Hercules aircraft

The Hercules fleet has not met operational requirements for serviceable aircraft.

The Department has 32 Hercules aircraft, 20 of them at 8 Wing–Trenton. We found that the Department has not always had enough serviceable Hercules at Trenton to achieve the tasks assigned to the fleet. On average, 13 percent of the time there have not been enough serviceable aircraft. The situation was at its worst in 2000–01, when 35 percent of the time not enough aircraft were serviceable.

Destroyer and frigate spare parts

Lack of timeliness in acting on a 1996 study to rationalize on-board spare parts caused the Iroquois class destroyers to carry $29 million in surplus spares for 57 months.

The Navy started the Warship Allowance Rationalization Project I (WARP I) in February 1996 to get rid of excess stock that Iroquois class destroyers were carrying. The plan was endorsed in January 1998, and the project proposal produced in June 1998. In February 2000, inventory managers estimated the value of excess stock for potential reduction at $29 million. Technical review and validation confirmed the estimates in June 2000, two years after the project proposal was produced. This two-year interim was needed for inventory managers and materiel managers to negotiate the numbers of spares needed on board and the acceptable risk of running out of stock. According to the plan, the unloading was to be completed by November 2000.

WARP II is a corresponding initiative for the Halifax class frigate. A November 2000 statement of work launched a study of the feasibility of offloading spare parts, to be completed by August 2003—even longer than the corresponding study for the destroyers. Based on WARP I, a further period of technical validation and negotiation can be expected to extend this initiative another two years. In March 2001, the value of excess stock for potential reduction was estimated at $26 million.

Iroquois class ships are carrying enough spare parts for certain items for about 20 years. Financial pressures on all naval budgets call for rationalizing the spares on board, for both efficiency and economy. Money spent on spares that will never be used ties up funds the fleet could use elsewhere. The decision on whether these items should be disposed of will be the subject of a WARP III project.

Impacts on operational training and deployments

Budget shortages and equipment support difficulties have affected training and deployments

10.67 Equipment must be maintained and available to ensure that collective training, exercises, and operations are conducted as planned and to prevent any negative impact on a unit's readiness. We set out to assess the impact that problems in equipment support may have had on Canadian Forces exercises and operational readiness.

10.68 Collective training and exercises assess the ability of the Canadian Forces to perform high-level tasks. They contribute to the readiness of the troops by maintaining their essential expertise and skills—in both combat arms and equipment support.

10.69 The Department provided us with post-exercise reports on 41 percent of exercises completed by the Navy, Army, and Air Force between 1998–99 and 1999–2000 that used major equipment. We reviewed those reports, departmental business plans, and post-deployment reports.

10.70 From the documents we reviewed, we could not conclude whether cancellation of exercises was related to equipment support difficulties, financial constraints, or increased operational demands. However, our review of departmental documents identified a number of equipment support problems that affected collective training and exercises.

10.71 **Navy.** Two of five post-deployment reports produced by Maritime Forces Atlantic cited spare parts problems. Both of these were related to the Sea King helicopters on board ships for exercises. In general, poor availability or capability of aircraft for missions results in the loss of many good training opportunities and severely restricts the service that the Helicopter Air Detachment can provide to the ship.

10.72 Five of nine Maritime Forces Pacific exercises for which we found post-exercise reports noted spare parts problems. The two problems cited most often were insufficient spares in the pre-deployment pack-up kits and the length of time it takes to ship and receive parts from Canada. These problems have affected exercises. For example, during an exercise a frigate experienced critical system failures and had no pack-up kit available. As well, when one of its diesel engines failed, an urgently needed part had to be flown to the nearest port. Repairs took longer than anticipated, due to the challenges of depending on a commercial flight. The deployment was eventually redefined because of this marine system operational deficiency.

10.73 To maintain operational commitments, the Navy has moved to a "tiered readiness" system, allowing the use of resources to remain as flexible as possible. This means that some ships are kept at a lower level of readiness than others.

10.74 **Army.** In order to use its available resources to maintain operational commitments, the Army has significantly reduced its training of combat teams and battle groups. Combat team training is the minimum level that must be maintained to ensure continued competence in general-purpose combat operations. Below this level, there is a risk that the unit could not respond within the warning times stated in the Defence Planning Guidance. Today, only units being sent on operational missions receive training above the combat team level. This has led to less-than-optimal levels of training and a decline in combat arms and warfighting skills throughout the Army.

10.75 Vehicle shortages have led to the moving of a fleet of vehicles from one brigade area to another to carry out training. The Army's lessons-learned report on Operation Palladium noted that all unit and brigade areas had trouble getting Bison armored personnel carriers to use in training; there simply are not enough to meet the demand. As a result, drivers of the Bison, and in some cases the other wheeled armoured vehicles, were sent to Bosnia–Herzegovina with a minimum of experience. This problem had occurred previously in Operation Alliance and Operation Stable.

10.76 The 2 Canadian Mechanized Brigade Group (Petawawa) received 34 Grizzlies, two AVGP Huskies, and two Bison from Land Force Western Area (Edmonton) to support its training for Operation Palladium. This

equipment had been driven hard in preparing several rotations of troops for missions. The lack of ownership by the units using the equipment resulted in poor maintenance and thus low serviceability. Inspections showed that the fleet arrived with 92 percent of vehicles not in service while they underwent repairs. This fleet was also a significant burden to the Brigade once training was completed, because it then had to be sent to Land Force Quebec Area to prepare for deployment. Army officials told us that they now own enough LAV III vehicles to meet training requirements.

10.77 **Air Force.** During 1998–99, officers of 8 Wing reported that in two of six collective training exercises they had to change unserviceable Hercules aircraft several times to complete the exercises. In 1999–2000, exercises were reduced dramatically. It is getting harder for both aircrew and support personnel to keep their training up-to-date.

10.78 Over the past three years, the lack of available spare parts has greatly impeded 8 Wing's global and domestic training. Its 2000–01 business plan states that if the shortage of spare parts for an aging fleet is allowed to continue, readiness will inevitably decline. This could also have safety implications.

10.79 We found that 10 of 27 post-exercise reports by 14 Wing on Aurora exercises in 1999–2000 show that deficiencies in the flight director indicator interfered with the success of the exercises. As well, 5 of 16 post-exercise reports by 19 Wing on Aurora exercises in 1999–2000 note that the exercises were affected by problems in the delivery of spare parts. Two of those five reports said that missions were cancelled and training opportunities lost as a result.

10.80 We reviewed 61 post-deployment reports on the use of the Sea King aboard ships from 1 April 1995 to 31 March 2000. We found that 54 of the reports mention at least one of the following problems: scheduled mission that was cancelled for aircraft maintenance; mission degraded by aircraft's lack of serviceability; poor serviceability that had a negative impact on training; major snags that caused significant downtime; and aircraft that were grounded. Examples of the Sea King serviceability problems are illustrated in the extracts of the reports shown in Exhibit 10.8.

Collective training and exercises are being scaled down

10.81 Two of the services gave us examples of exercises that had been scaled down. These exercises were conducted with fewer personnel or less equipment than originally planned, due to technical reasons, unavailability of equipment, movement of personnel, or financial constraints. We were unable to determine how many exercises had been reduced and with what overall impact.

10.82 The Navy on both the East and West coasts provided four examples of ships that have reduced or cancelled their participation in an exercise since 1998. For example, HMCS *Montreal* reduced its participation in a major exercise from five days to one day because of ongoing technical problems;

HMCS *Iroquois* cancelled its participation for technical and personnel reasons. Financial constraints were a factor, but not the deciding one.

10.83 Two of the three operational Army brigades gave us examples of exercises that had been scaled down. In one case, Leopard and Coyote squadrons were not deployed as scheduled, due to financial constraints and unavailability of vehicles. Furthermore, the number of personnel involved was reduced from 2,415 to 1,516 before the exercise began.

Exhibit 10.8 Sea King serviceability problems

High unserviceability

"I can honestly say that in the 17 years I have spent in the Sea King community, through all my deployments, this is the first time I was sincerely embarrassed to be associated with this helicopter, due to her constant and consistent unserviceability and resultant air detachment inability to contribute meaningfully to the ship combat capability or the force in general." (NATO deployment, 10 August to 15 December 1998)

Poor serviceability had a negative impact on training

"As can be seen by Salty Dip 1/95, more than one Sea King may be required to successfully complete the exercise. In this case, five aircraft were used in only three and a half flying days. This meant that subsequent aircraft were not completely equipped and valuable training was missed." (Salty Dip exercise, 11 to 20 April 1995)

Availability of aircraft lowered motivation and morale

"The limited operational capability and availability of the CH–124A had a profound impact on the motivation and morale of the members of the detachment. Many found it difficult to rationalize the motivation required to work extremely long hours to make airworthy an aircraft that was rarely fully mission-capable and, even when mission-capable, of extremely limited tactical benefit to the ship." (Work-ups, HMCS *Iroquois*, 31 May to 26 June 1999)

Some deployments have been affected

10.84 To determine the impact of equipment support problems on operations, we reviewed end-of-tour reports. The Canadian task force commander is required to submit an end-of-tour report at the end of each mission rotation. The report describes the major problems of the mission as a whole and their impact on the Canadian contribution. Of the 29 required reports, the Department provided us with 21. Two were never completed and six remain unaccounted for.

10.85 The end-of-tour reports provided by the Department cover seven of the eleven missions in our sample (Exhibit 10.9). Of these seven missions, five reported problems getting spare parts—mainly the amount of time it took to get parts to the theatre. We were unable to determine the impact of these problems on operations. In one case, however, aircraft were grounded while awaiting parts; in another case, Canadian CF–18 Hornet crews borrowed parts from the Spanish Air Force so they could conduct operations.

End-of-tour reports were not explicit enough for us to establish the extent of the problem.

10.86 The recent CF–18 Hornet deployment to Aviano, Italy on Operation Echo, part of the North Atlantic Treaty Organization (NATO) contingent in Kosovo, illustrates some of the spare parts problems (Exhibit 10.10).

10.87 Canadian Air Force CF–18 Hornet aircraft had been sent earlier to Aviano, Italy as part of Operation Mirador flying missions in Bosnia–Herzegovina. The end-of-tour report noted that spare parts and equipment critically needed to keep the CF–18 Hornet serviceable were improperly routed, incurring unnecessary costs and leaving aircraft on the ground and unserviceable. Fortunately, the pace of operations and the exceptional work of the aircraft technicians meant that all operational tasks were completed.

10.88 The end-of-tour report on Operation Kinetic, Rotation One, to Kosovo noted that when spare parts and equipment needed immediately were more than the Hercules sustainment flight could carry, the units waiting for them had no opportunity to assign priority to items, or even to learn which items would be on the flight.

10.89 We were provided with six out of seven end-of-tour reports on Operation Palladium in Bosnia–Herzegovina. The reports highlight a number of impacts that equipment deficiencies had on operations. Exhibit 10.11 provides an overview of the problems encountered on each rotation.

Exhibit 10.9 **Eleven international missions in our audit sample**

Mission	Operation name	Country	Number of rotations	End-of-tour reports provided	Personnel	Incremental cost	Full cost
						($ millions)	
1	Tranquility	Persian Gulf	1	0	210	4	29
2	Alliance	Balkans	3	2	1,029	53	203
3	Stable	Haiti	3	2	2,250	50	158
4	Assurance	Zaire/Rwanda	1	0	354	15	41
5	Prevention	Persian Gulf	1	0	210	3	42
6	Mirador	Italy/Bosnia–Herzegovina	1	1	112	2	33
7	Determination	Persian Gulf	1	1	338	4	51
8	Palladium	Bosnia–Herzegovina	7	6	1,649	492	1,518
9	Echo	Italy/Kosovo	8	8	102	57	760
10	Kinetic	Kosovo	2	1	1,300	235	516
11	Toucan	East Timor	1	0	721	34	127
	Total		**29**	**21**	**8,275**	**949**	**3,478**

Exhibit 10.10 Spare parts problem—CF–18 Hornet deployment on Operation Echo

"The re-supply of batteries. Spare CF–18 Hornet batteries were not brought from 3 Wing for the initial deployment (Rotation Zero). Hence, there were no spare batteries at the beginning of the operation. This oversight was corrected by ordering spares at the beginning of the operation, but delivery was unacceptably long. Rotation One arrived in-theatre with no spare aircraft batteries. They were automatically ordered immediate operational requirement and received two months later. The batteries were received depleted and chargers had to be ordered. The CF–18 Hornet batteries have to be charged at every supplementary check (every 100-flight hours). After having done some of these inspections in Aviano, the stock of spares was depleted. Once again, the batteries were ordered immediate operational requirement but it took an unacceptable time to get them. This forced an extension to the life of the in-aircraft batteries beyond the authorized limits in order to meet operational requirements. Finally, as an interim measure and to maintain operational effectiveness and preserve flight safety, batteries were borrowed from the Spanish Air Force."

Source: Operation Echo, Aviano, Italy, end-of-tour report

Exhibit 10.11 Problems encountered by Operation Palladium

Rotation Zero. "Too often, vehicles sat in maintenance awaiting parts, sometimes for several weeks. These delays often impacted on the operation's effectiveness. Spare parts delivery for the Grizzly was slow and had a direct impact on the unit's effectiveness."

Rotation One. "Maintenance support to CCSFOR (Canadian Contingent Stabilization Force) has been good. The only difficulties encountered have been the result of delays in obtaining spare parts. The problem is not critical but does require constant monitoring."

Rotation Two. "The maintenance of the AVGP (armoured vehicle, general purpose) fleet is also an ongoing challenge as vehicles are in constant need of maintenance due to high-usage rates, the terrain, and the age of the fleet."

Rotation Three. "Several specialist trades are returning too frequently. The size of the Land Force combined with a long-term commitment to stay in Bosnia–Herzegovina means many soldiers could be faced with successive tours. On several occasions immediate operational requirements (IORs) parts for the Griffon helicopter sat at Trenton and was not placed on the first available flight. The average time for an IOR to reach Bosnia was 5–6 days. The quickest was three days and the worst was twelve days."

Rotation Four. "Tour fatigue issue was raised as several specialist trades are returning to this theatre too frequently. As well, certain positions have been under-ranked in order to fill them. This problem is exacerbated by a Forces-wide reduction in the number of courses necessary to qualify soldiers to the next rank level."

Rotations Five. "Problems were encountered in the delivery of spare parts (aircraft on ground) to the Griffon helicopter detachment. As well the tour fatigue and under-ranking of positions is once again reported."

Rotation Six. End-of-tour report was not completed.

Source: Operation Palladium, Bosnia–Herzegovina, end-of-tour reports, 1997–2001

Equipment readiness information

Management lacks much of the necessary information

10.90 Management information needs to be available and used to manage personnel, spare parts supplies and inventories, equipment status, and operational readiness. We found in general that the needed data were often unavailable, except data on spare parts. The information that was available was inadequate, incomplete, and often inaccurate.

10.91 Information on the state of equipment is collected separately by the Canadian Forces, by each service, and by individual support functions such as human resources and supply. We examined the Department's capacity to provide adequate information at each of those levels on the state of its equipment and equipment support functions.

10.92 **Canadian Forces.** In March 2000, the Canadian Forces introduced the Operational Status Display system. This system reports on the status of the Canadian Forces Vanguard units (the quickly deployable standby forces called for in the 1994 Defence White Paper). It also tracks the history of their readiness based on information provided and updated weekly by readiness systems of the Navy, Army, and Air Force. The Operational Status Display system reports on 4,000 personnel, around 7 percent of the Canadian Forces.

10.93 There is no system, however, that provides an overview of the state of all major weapons platforms operated by the Canadian Forces.

Reports on collective training and exercises often not completed and analyzed

10.94 Each service's Chief of Staff requires that a post-exercise report be completed at the conclusion of an exercise. Post-exercise reports provide information on what the exercise was supposed to accomplish, what actually was accomplished, and what problems or successes occurred. They permit the Canadian Forces to learn and benefit from the exercises they conduct.

10.95 We were provided with 41 percent of the post-exercise reports required across the Canadian Forces for 1998–99 and 1999–2000 (Exhibit 10.12). Departmental officials were unable to confirm whether the missing reports had not been produced or could not be found. Those that were provided to us were not specific about the effects of equipment deficiencies on exercises. For example, the Navy post-exercise report policy states, "Comments of special significance or vital interest or items which may require extensive detailed explanation should be briefly covered in the report and then be followed by a separate correspondence."

10.96 **Navy.** The Navy's Operational Deficiency report is used to tell formation and operational commanders about restrictions on the capability of their fleet units to conduct operations. Units submit these reports when equipment fails to meet established performance criteria.

10.97 The Navy has begun collecting systematic data on availability and serviceability of major systems. In 2000, the Consolidated Maintenance Information System (CMIS), which collects information such as maintenance hours, started to collect data on reliability, availability, and maintainability (RAM). RAM data are collected for certain major subsystems on the Halifax

and Iroquois class ships. However, the Navy will have to overcome problems in the system in order to obtain useful information from it.

10.98 Data on corrective and preventive maintenance hours, obtained at our request from CMIS for 1996 to 2000, contained significant errors. According to Navy officials, the errors were mostly due to difficulties with data query techniques. For example, preventive maintenance hours on Halifax class ships in 1998 were shown initially at 1,050,394 and later were revised to 182,772. Officials explained that the revised number is the more accurate, thanks to recent improvements in the data query techniques and significant efforts to clean up data.

10.99 Several factors have influenced the accuracy and currency of the data. Navy officials explained that to simplify the development of the information system, data on minor maintenance were initially excluded. The Navy only recently started again to record hours for certain minor preventive maintenance routines—routines that nonetheless cumulatively represent a significant amount of maintenance. Some maintenance action forms were entered into the system more than two years after they were created, and the figures were only estimates. Some data were lost due to bad disks and server crashes. Often data entry is not timely.

10.100 We noted deficiencies in the recording of maintenance costs. The Navy does not keep separate track of the costs of spare parts consumed.

10.101 **Army.** The equipment status reports used by Army brigades provide a monthly overview of the state of each brigade's vehicles; units carrying out missions provide weekly reports. But the reports do not deal with the impact of equipment deficiencies on operations and exercises. At the conclusion of our audit, the Army was in the process of validating its reporting system.

10.102 We noted that brigades do not always prepare monthly reports. Moreover, brigade reports are not prepared on a consistent basis and there are some key differences among them. In their equipment status reports, for example, brigades apply different definitions of "operational" to vehicles. And they use different criteria to decide whether a vehicle undergoing maintenance is serviceable.

Exhibit 10.12 **Post-exercise reports (1998–2000) received**

Service	Number required	Number received	Percentage received
Navy*	114	41	36
Army	83	29	35
Air Force	314	140	45
Total	**511**	**210**	**41**

*The post-exercise reports provided by Maritime Forces Atlantic were in draft form, as none had been approved through the chain of command since 1997.

10.103 While the brigade reports may meet the needs of individual brigade commanders, unless they all report the same kinds of information in a consistent, comparable way their usefulness for reporting operational readiness to National Defence headquarters is limited.

10.104 Since 1979, the Army has collected additional data centrally on the operational availability of equipment. When a new software control system was put in place in 1999, the collection of data at National Defence Headquarters was interrupted; central data collection was reinstituted in fall 2000 and a new central data collection system was not completed until April 2001.

10.105 In deployed units, maintenance staff prepare two reports on the operational status of equipment. The first report provides statistics only on the serviceability of various automotive systems. The second report provides data on serviceability of the weapons and fire control systems attached to the vehicles. The two types of statistics are not rolled up to provide an overall picture of the state of the deployed equipment.

10.106 **Air Force.** The Department could not provide complete, accurate information on aircraft availability beyond April 1999, because its data system did not survive the Year 2000 changeover. The last data the system generated did not include all downtime for maintenance and therefore overestimated the availability of aircraft for operations.

10.107 The Department does not have an official standard for the operational availability of aircraft. The main goal of the maintenance section is to meet the operational requirements of the flying crew. One way the maintenance section evaluates performance is by comparing the number of successful flights with the number of flights planned by operators. However, we found cases where units did not plan missions if they knew aircraft were unserviceable, and their statistics thus overstated operational availability. We also found that for some missions, there were no historical records comparing completed sorties with planned sorties.

10.108 **Personnel.** In 1997, the Department began implementing PeopleSoft, a new personnel management information system. In August 2001, the Department was upgrading the system; however, it needs to improve user training. Users do not help improve this central system. For example, they do not enter qualification data into the system consistently or in a timely way. Instead, users have developed parallel and duplicate systems to gather personnel data but have failed to enter those data regularly in the corporate system.

10.109 We asked the Department what percentage of military personnel had successfully completed specialty courses and at what qualification level. While the PeopleSoft system is able to track this information, the data either had not been entered or were not accurate. We had to compile the data manually by contacting individual units.

10.110 **Information systems.** Data are too inaccurate or incomplete to indicate how ready major equipment is and to determine cost trends. Also,

the Department is not realizing the full benefits of some systems, such as CMIS and PlannExpert. It needs to improve its information systems and audit the quality of the data they produce.

10.111 The lack of adequate information is a serious problem, with potential consequences for both costs and operations. Poor information on the state of equipment makes it hard to control costs. Senior management cannot determine accurately how much it could save by reducing levels of readiness, as it plans to do. Poor scheduling of repairs and overhaul and the late detection of fleet-wide component failures create inefficiency. Poor information increases the likelihood that tools, equipment, and spare parts will be overstocked or understocked.

10.112 Without good information on the state of major weapon systems, it is hard to determine how ready the Canadian Forces are for major operations. It is difficult to verify the Department's repeated assurance that the Canadian Forces are more combat-capable than they were 10 years ago. That assurance is questionable, given the declining readiness of the major aircraft fleets, the impairment of the CP–140 Aurora's capability for maritime patrol, and the growing backlog of naval maintenance work.

10.113 The failure to make required post-exercise and end-of-tour reports and the poor quality of many of the databases we examined indicate a lack of management discipline.

Corrective action

The Department is taking steps to correct the problems we found

10.114 At present, needed information is scattered among 1,300 systems in all services and locations, each developed to meet particular objectives. Many different users now collect the same data for various purposes. The accuracy of the data is often questionable. These systems do not readily transfer information to other systems; when transfer occurs at all, it is typically by disk or on paper.

10.115 In 1994, the Department recognized that it needed an integrated system for materiel acquisition and support functions, harnessing work that had started on the development of separate information systems for the Navy, the Army, and the Air Force. The Materiel Acquisition and Support Information System (MASIS) project received preliminary approval in 1998. MASIS was launched in September 1999 at the 202 Workshop Depot in Montreal. It is now being implemented across the Department and is expected to be operating fully by 2004. The goal of the system is to provide integrated information for materiel acquisition and support functions such as engineering, logistics, equipment configuration, project management, maintenance, operational support, analysis for decision making, and contract management.

10.116 The Department believes that MASIS will not only reduce the cost of maintaining actual information systems but should also contribute to improved availability of equipment, better inventory of spare parts, and lower maintenance costs in both dollars and personnel. The Department's sharing

of this information with manufacturers and contractors is intended to make all three more efficient.

10.117 According to departmental officials, the Canadian Forces Supply System Upgrade (CFSSU) project will deliver a much improved tool to manage inventory, including better visibility to the users and better delivery of materiel to customers. The capabilities of this system will be complemented by a distributed resource planning module that will optimize procurement, warehousing, and distribution. The implementation of the CFSSU will be completed by the end of summer 2002, and then the Department will begin to implement the distributed resource planning module.

10.118 The Department is developing a framework for reporting to the Chief of the Defence Staff on its management of overall performance across the Canadian Forces, including their operational readiness. Each service will provide data on its readiness, which will be integrated with other information on results to give senior staff a much more complete and balanced look at the status of the Canadian Forces. The Department has been developing a readiness reporting system since 1994 and intends to have the performance measurement framework in place by mid-2001.

10.119 Through the Materiel Acquisition and Support Desktop tool, the Department is also actively pursuing its in-service management policy and updating its business processes. The aim is to have performance standards and goals for the equipment and associated data collection requirements addressed adequately in the acquisition phase, and observed during the in-service phase. The Desktop serves as one of the Department's primary tools for knowledge management.

10.120 Finally, equipment acquisition and upgrade programs should greatly increase aircraft serviceability. In particular, the upgrades of the CP–140 Aurora and CF–18 and the replacement of the Sea King should have a significant impact. The upgrades will not be completed for a number of years, however, and no delivery date has been set for the Sea King replacement. In the meantime, the Air Force will probably be unable to increase the readiness of its equipment.

Conclusion and Recommendations

Information management systems not up to the job

10.121 The Department's most significant problem is that its information management systems are not up to the job of supporting the management of Canadian Forces equipment. The lack of information makes it difficult to determine whether or not maintenance practices are efficient. It also presents a serious barrier to the Department's plan to economize by reducing readiness systematically to minimum levels. Moreover, without adequate standards for equipment maintenance and the ability to measure whether they have been met, it is difficult to know whether low-readiness forces could be regenerated, if necessary, in the time prescribed in the White Paper.

Lack of qualified people to support equipment

10.122 The Department is also having difficulty staffing its equipment support organization. There are too few support personnel to staff operational units and major maintenance depots at required levels. Equally serious is that many equipment support personnel—about 15 percent—lack the qualifications required at their ranks. In addition, maintenance personnel lack a large amount of the specialty training required in their particular units.

10.123 Nevertheless, over the last five years the Canadian Forces have been able to maintain the level of activity of the Navy and increase that of the Army. Air Force activity levels have declined, due mostly to budget cuts and the reduced need to keep a large portion of the Canadian Forces at a high level of readiness.

10.124 The military maintenance services of the Department have been able to keep equipment serviceable at fairly constant levels, though in the Air Force the level is declining as aircraft age.

10.125 Over the last five years the Department has maintained its ability to provide spare parts for equipment, but at a low level of service. Most parts that are needed urgently are not received on time. Except in a few specific cases, our audit did not establish a correlation between the availability of spare parts and the availability of equipment to support operations.

10.126 There is some evidence that the inability to keep equipment repaired has hampered training and operations, but it has not resulted in any critical shortages of equipment. Overall, the level of service appears to be adequate to the present level of tasking—but only adequate. It appears that the Canadian Forces do not have much capacity to tolerate further decline.

10.127 **Recommendation.** National Defence should take steps to ensure that it can manage effectively the readiness of its most important equipment. In particular, it should set standards for readiness that would provide for clear maintenance objectives in individual units and against which senior management at headquarters could assess the readiness of entire fleets.

Department's response. This Department applies a variety of safety and operational standards for determining whether individual pieces of equipment are able to perform assigned missions. Due to the very situation-dependent nature of concepts such as "readiness" and "availability," however, assigning common standards and determining collective readiness represents a complex and costly proposition. Although National Defence does not yet have a reporting system that tracks overall equipment availability, the Canadian Forces have nevertheless continued to demonstrate their ability to put effective, combat-capable forces into the field on a regular basis.

The Department and the Canadian Forces recognize the need to manage readiness and are committed to developing reporting systems that provide meaningful, readiness-related information to assist decision making at all levels. Further development of these reporting systems will take the Auditor General's recommendations into consideration.

10.128 **Recommendation.** As well as fully implementing such systems as MASIS to address its long-standing needs in maintenance management, the Department should take interim steps to improve its ability to manage in both the short and the long terms. These interim steps should include ensuring that adequate information is available on equipment readiness and maintenance; and auditing or otherwise validating the information in its maintenance management information systems.

Department's response. The Department recognizes the short-term need to ensure that our many maintenance management information systems provide adequate information on equipment readiness and maintenance. National Defence will continue to enhance interim steps to guarantee the reliability of information contained in maintenance legacy systems. The Department's priority remains firmly with the full implementation of the MASIS system. Part of this implementation is the requirement to validate the Department's existing Maintenance Management Information Systems (by environment), to ensure the integrity of data transferred to MASIS. The Department will accelerate the validation of the information in its maintenance management information systems. This will assist in the transition to MASIS and in long-term environmental rollouts and improve our ability to manage equipment readiness and maintenance in the short and long terms.

10.129 **Recommendation.** The Department should enforce the requirement to complete post-exercise and post-deployment reports.

Department's response. The Department is pursuing ways and means of improving post-exercise and post-deployment reporting with a focus on strategic-level exercises and deployments. A key enabler will be the development of a strategic-level lessons learned database. It should be noted that certain of the military environments already have a well-developed and proven lessons learned database and dissemination process.

10.130 **Recommendation.** In its plans to improve recruiting and retention of military personnel, the Department should give high priority to equipment support occupations. On an urgent basis, it should rectify gaps in maintenance training .

Department's response. While the Canadian Forces recognizes it has difficulty attracting new recruits into some of its technical trades, it has taken several steps to correct the situation both in the short and in the long terms. To quickly improve the situation in the technical occupations, the Canadian Forces has targeted college-qualified personnel by offering significant recruiting allowances and enrolment at the Acting Corporal level, which offers a better starting salary. In addition, our advertising and marketing campaigns place special focus on the understrength technical occupations.

With respect to training gaps, it is acknowledged that a number of technical occupations have backlogs for specialty training. A concerted effort is now being undertaken by all Canadian Forces Technical Schools to reconcile this situation. However, it must be emphasized that the effect on operational readiness and capability is not as bleak as portrayed in this chapter. In most

technical occupations, both on-the-job experience and specific specialty training are the two complementary prerequisites for specialization. This could take two to five years in many cases. During these periods, Canadian Forces technicians typically work in teams with qualified supervision to ensure that equipment and systems are properly maintained.

Overall, the Canadian Forces is addressing the challenges in recruiting, training, and retaining its technical personnel. The current shortages and training backlog do not affect our operational readiness and capability to undertake White Paper commitments. The comprehensive strategies that we have already implemented are focussed on resolving our current deficiencies as rapidly as possible.

10.131 Recommendation. The Department should address the problems of supplying high-priority spare parts to deployed units, as raised in end-of-tour reports, especially the problems in administrative functions such as shipping and transportation.

Department's response. The problems encountered in the supply of high-priority spare parts to support the operations of deployed units have been studied repeatedly since the Gulf War. To determine the appropriate supply levels of spare parts to be held at any given time in theatre is a difficult task, strongly influenced by factors such as equipment numbers, expected intensity of operations, climatic conditions, the length of the supply line back to Canada, the ready availability of national stocks, and the availability of CF aircraft and commercial transportation for resupply.

Notwithstanding the inherent difficulties in supplying spare parts to overseas theatres, the Department is committed to finding solutions. The process for supplying spare parts is being reviewed at a number of levels to determine where improvements can be made and to streamline the process. As part of the review, the demand for high-priority spare parts and the response times will be monitored. As well, direction for international operations will be reviewed to provide improved guidance to Task Force Commanders regarding the delivery of spare parts. The main thrust of the review will be to ensure that the appropriate support is in place to achieve each mission's individual requirements, with particular emphasis on high-priority demands.

About the Audit

Objectives

The overall objective of our audit was to determine whether major equipment platforms were maintained adequately by National Defence and the Canadian Forces. Specifically, we sought to do the following:

- assess the extent to which major equipment has been available to the troops for training and operations; and
- assess whether the Department has taken appropriate action to optimize the equipment availability rates of its major fleets.

Scope

Our audit focussed on the factors that affect the availability of major equipment that the Navy, Air Force, and Army need to achieve their missions and tasks namely, personnel qualifications, personnel shortages, and availability of spare parts. To the extent possible, we based our audit on the Department's own standards for equipment availability. We selected the following major equipment fleets:

- **Army**: Bison, Coyote, Grizzly, heavy logistic vehicle wheeled (HLVW), medium logistic vehicle wheeled (MLVW), based on the high usage of these vehicles.
- **Navy**: Halifax class frigates, Iroquois class destroyers, supply ships, and Maritime Coastal Defence Vessels, the main combat fleets. We excluded submarines because the Oberon class had been decommissioned and the Victoria class had not entered into service by the time of our audit.
- **Air Force**: CF–18 Hornet, Hercules, Aurora, Sea King, and Griffon, the main combat fleets.

The Department considers these vehicles to be its most important operational platforms.

We did not include contracted maintenance services in the scope of our audit.

Except in a few specific cases, the audit did not establish a correlation between the availability of spare parts and the availability of equipment to support operations.

We sought to identify factors that could explain limitations on availability (for example personnel shortages, qualifications, or spare parts) and assess the impact of gaps in availability over the last five years.

Trend analysis focussed on operational availability, sorties (Air Force), and activity rates of the three services. Maintenance hours per activity, maintenance costs per fleet, age of equipment, and national procurement funding were also assessed. We sought to analyze trend data in order to conclude what impact equipment maintenance had on the serviceability/availability of equipment, generally over a five-year period. We used various departmental databases during the course of our audit. It was not possible, given the scope of our audit, to completely validate the databases.

To assess human resource management, we judgmentally selected 36 maintenance military occupational classifications and a sample of 49 maintenance units to identify equipment related maintenance problems. Our selection was based on operationally deployable units and major third line repair depots. These units employed about 5,000 of 15,000 military maintenance personnel. We surveyed the selected maintenance units to collect data on personnel shortages and qualifications and to assess the overall impact this had on exercises and operations.

We reviewed departmental files, including post-exercise reports, departmental business plans and end of tour reports for international operations, in order to assess the impact of equipment maintenance deficiencies on the conduct of exercises and operations of the three services. In order to collect information, we visited the two Navy formations (Halifax and Esquimault), and the three operational brigades (1 Canadian Mechanized Brigade Group—Edmonton, 2 Canadian Mechanized Brigade Group—Petawawa, and Canadian Mechanized Brigade Group—Valcartier). We also visited various Air Force wings (1 Wing—Kingston, 8 Wing—Trenton, 12 Wing—Shearwater and Patricia Bay, 14 Wing—Greenwood, 17 Wing—Winnipeg, and 19 Wing—Comox).

Criteria

We expected that National Defence would do the following:

- have and meet its own standards for availability of major equipment fleets;
- develop and implement adequate maintenance systems to ensure the availability of targeted equipment;
- meet its targets for numbers of maintenance personnel and train them to its established standards; and
- have an adequate system to report to the Chief of the Defence Staff on the state of readiness of major equipment and on equipment maintenance problems.

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