135 Bell-Irving Squadron

Level Four Handbook

PO 420 – Canadian Air Force Traditions

Part 1 – Canadian Air Force Traditions

Formal Dinners

Christmas Dinner. A Christmas tradition within the military is to have the youngest member of a unit become the honorary wing commander or commanding officer. This practice of role reversal with minor privileges dates back to Roman times, but the custom became a standard practice in the British military during the 18th century. To offset boredom of waiting and watching during war, officers would organize celebrations for the men. The recent addition is for another private to exchange coats with the chief warrant officer or squadron warrant officer. The remaining officers and warrant officers prepare and/or serve the enlisted members. This helps boost morale and show appreciation for the enlisted ranks.

Mess Dinner. The most important mess tradition of the CF. Historically, the mess dinner was the time when members sat down for dinner with their CO. It was a custom formed as a result of the rules of gentlemanly conduct. The present-day mess dinner evolved from the customs and traditions of former Royal Canadian Air Force (RCAF) officers' messes and can be adapted for use by senior non-commissioned members (NCM) and junior members.

A mess dinner is considered a parade requiring all unit members to attend. Dress, time of assembly and other details are specified. To enjoy the formality of the setting, immature or offensive behaviour is not tolerated. The President of the Mess Committee (PMC) ensures that a high standard of decorum is maintained. The official host is normally the senior officer / non-commissioned officer (NCO) of the organization or a representative. The guest of honour is escorted to the mess or met at the entrance by the official host. The official host and the guest of honour are met by the PMC, who will introduce both to the members of the mess.

A piper or bugler announces a 15-minute and 5-minute notice to the members before the start of the dinner. During World War II (WW II), Group Captain Fullerton introduced the use of the piper during a mess dinner to celebrate Robbie Burns Day. The association with the Scottish heraldry has continued with this tradition.

The use of a head table dates back to the time when military units were full of single officers and the mess was their home. The CO wanted to ensure all members were in attendance and observe their behaviour. The head table was established with other members of the mess placed at tables extending out from the head table like arms, permitting the CO to see everyone.

The loyal toast differs among elements within the CF. The Air Force tradition includes the port being piped in by a piper. The port decanter never touches the table, symbolizing the flying aspect of the Air Force. The actual toast is the same throughout the CF; it is a toast to The Queen of Canada / La Reine du Canada.

Traditionally, a gentleman's evening wear was black tie. A military adaptation of a formal mess uniform was first developed with the air force pattern in the late 1920s. As fashions changed, the mess kit pattern changed. During unification in 1968, a new tri-service mess dress was adopted by the CF. The army and navy havereturned to their more traditional mess kits but Air Command decided to retain the tri-service mess kit. Members are responsible for the purchase of their mess kit.

Dining-in night. An informal dinner for the members of the mess. To retain the family spirit among the members of the mess, an informal dinner is held to welcome and say goodbye to members. Dress is less formal but attendance is mandatory, unless excused by the PMC. Dinner can be served as a buffet or a normal meal and arranged seating is not required, except the CO and SWO occupy their normal positions.

Mixed dinner. A mixed formal dinner or dining-in night when spouses / guests are invited to join the members of the mess. A mixed formal dinner follows the protocol for a mess dinner with the addition of a receiving line. The gentleman escorts the lady seated to his right and will fill the glass of the lady to his left when the port is passed. Ladies, other than commissioned officers, will not stand during the playing of marches. A mixed dining-in night is less formal but follows the procedure for a dining-in night. The reviewing line is comprised of the CO or SWO and spouse / guest, senior military guest and spouse / guest and the PMC and spouse / guest. The names of the member and guest are announced as they begin the receiving line.

Missing-Man Formations

The missing-man formation is a flypast during which a four-aircraft formation flies past with the number three aircraft either missing or performing a pull-up manoeuvre leaving the formation to signify a lost comrade in arms.

During World War I (WW I) the Royal Air Force (RAF) crews would perform flyovers when they returned to their home airfields to alert the ground crews that they were returning to base. During the flyover, the ground crews would take note of how many crews were returning. The layout of a tight formation was very rigid and the ground crews were able to figure out who was missing.

The first official missing-man formation is rumoured to have occurred during WW I when British fighter pilots flew over the funeral of Manfred 'Red Baron' von Richthofen as a sign of respect. The RAF performed the first public missing-man formation in 1935 when flying over a review for King George V. During WW II, the missing man formation evolved into a ceremonial tradition as part of the RAF.

Change of Command Ceremonies

The change of command ceremony dates to the 18th century during the reign of Frederick the Great of Prussia. Organizational flags were developed with colour arrangements and symbols unique to each particular unit. The soldiers of the unit dedicated their loyalty to the flag and its commander. When a change of command took place, it was done in front of the unit by passing the flag to the individual assuming command. The unit witnessed their new leader assuming his dutiful position.

Modern change of command ceremonies can be as simple as a signing ceremony conducted in an office or auditorium or can involve a wing / squadron review being held to mark the occasion. A presiding officer, normally the senior formation commander, is the reviewing officer (RO). The format of the change of command has been adjusted if it takes place on parade. The ceremony includes:

1. The incoming CO arrives with the RO and accompanies the RO as part of the inspection party.
2. The outgoing CO marches the wing / squadron past once and reforms on the inspection line.
3. Presentations, certificates signing and addresses are made.
4. The incoming and outgoing COs exchange positions.
5. The wing / squadron under command of the incoming CO marches past the outgoing CO. The wing / squadron advances in review order and pays compliments to the departing RO.
6. The RO departs accompanied by the outgoing CO.

The signing ceremony involves the passing of the unit colours and the signing of the change of command certificates under the supervision of the presiding officer. Passing the unit colours, signifying the transfer of command includes:

1. The presiding officer and the incoming CO move to a position in front of the dais.
2. The outgoing CO proceeds forward and halts in front of the presiding officer.
3. The Colour bearers are ordered to advance with the outgoing CO.
4. The outgoing CO salutes the presiding officer.
5. The Colour bearers present the Colours (starting with the Queen's Colour) to the outgoing CO.
6. The outgoing CO hands the Colours to the incoming CO.
7. The incoming CO hands the Colours back to the bearers.
8. The bearers face the inspection line.
9. The incoming CO orders the Colour bearers to return to their post.
10. The incoming and outgoing COs move to a table beside the dais to sign the change of command certificates.

Answer the following questions on a separate piece of paper, using the information above.

1. What is the most important mess tradition of the CF?
2. For what dinners are spouses/ guests invited to join the members of the mess?
3. What does the missing-man formation represent?
4. What does the exchange of the unit colours signify?
5. Name two locations where a change of command is held.

Part 2 – Royal Canadian Air Force Ranks

RCAF Non-Commissioned Ranks

The Royal Air Force (RAF) developed its rank insignias in 1918 moving from the British army ranks. With the formation of the Royal Canadian Air Force (RCAF) on April 1, 1924, the rank structure of its airmen and officers were similar to the ranks worn by the RAF and other Commonwealth countries. The rank insignias closely resembling the air cadet ranks were used from 1939 until unification on February 1, 1968, at which time the Canadian Forces (CF) amalgamated the rank structure to its present design. In 1988, the air force returned to traditional uniform colour but retained the present rank insignias.

The non-commissioned rank insignia was worn centred on the upper sleeve on all orders of dress except the Warrant Officer's (WO) insignia which was worn on the cuff.

- The RCAF rank of Aircraftman 2nd class (AC2) had no insignia. The present CF rank insignia of Private (Pte) also has no insignia.
- The RCAF rank of Aircraftman 1st class (AC1) had no insignia. The present CF rank insignia of Private Trained (Pte [T]) is a single inverted chevron.
- The RCAF rank of Leading Aircraftman (LAC) was a propeller. The present CF rank insignia of Corporal (Cpl) is two inverted chevrons.
- The RCAF rank of Cpl had two inverted chevrons and was equal to the present CF rank of Master Corporal (MCpl). The MCpl insignia has a maple leaf above the two inverted chevrons.
- An RCAF Sergeant (Sgt) had three inverted chevrons and is equal to the present CF rank of Sgt except the present insignia has a maple leaf above the three inverted chevrons.

- The RCAF rank of Flight Sergeant (F/Sgt) had a brass or cloth crown worn above three inverted chevrons. The design of the crown changed from the King's Crown to the Queen's Crown with the coronation of Queen Elizabeth II in 1952. The present CF rank insignia of WO is the St. Edward's crown.
- The RCAF rank of Warrant Officer 2nd Class (WO2) was the King's or Queen's Crown. The present CF rank insignia of Master Warrant Officer (MWO) has the St. Edward's crown inside a laurel wreath.
- The senior RCAF non-commissioned rank was Warrant Officer 1st Class (WO1) had the British Coat of Arms.The present CF rank insignia of Chief Warrant Officer (CWO) has a larger sized Coat of Arms of Canada.

Officer Ranks
The RCAF officer ranks were divided into two categories: officers and air ranks (officers).

Officer ranks were based on flying appointments. Officer ranks were organized into three levels similar to today's organization, to include:

- Subordinate officers;
- Junior officers; and
- Senior officers.

Officer rank insignias were shown by different widths of ribbon. The RCAF ribbons included two shades of blue in thin, medium and thick widths. Each band included a strip of a lighter shade of blue between two strips of a darker shade of blue. The CF ribbons have the same widths but are a single colour of gold or blue, depending on the uniform.

Subordinate Officers

- The RCAF rank for an Officer Cadet (O/C) had no insignia. The present CF rank for Officer Cadet (OCdt) has a single thin gold band.

Junior Officers

- The RCAF rank for Pilot Officer (P/O) had a single thin blue band. The CF rank equivalent is Second Lieutenant (2Lt), which has a medium gold band.
- The RCAF rank for Flying Officer (F/O) had a single medium blue band. The CF rank equivalent is Lieutenant (Lt), which has a medium and thin gold band.
- The RCAF rank for Flight Lieutenant (F/L) had two medium blue bands. The CF rank equivalent is Captain (Capt), which has two medium gold bands.

Senior Officers

- The RCAF rank for Squadron Leader (S/L) had a thin blue band between two medium blue bands. The CF rank equivalent is Major (Maj), which has a single thin gold band between two medium gold bands.
- The RCAF rank for Wing Commander (W/C) had three medium blue bands. The CF rank equivalent is Lieutenant Colonel (LCol), which has three medium gold bands.
- The RCAF rank for Group Captain (G/C) had four medium blue bands. The CF rank equivalent is Colonel (Col), which has four medium gold bands.

Air Ranks (Officers)
The first blue band used on the RCAF air rank insignia was a thick band of light coloured blue between two medium bands of dark coloured blue. To show the difference in the ranks, blue medium bands were added on the RCAF officer rank insignia. Today's general officers have a wide gold band on their tunic cuff and the rank

insignia worn on their shoulders has the St. Edward's crown above a crossed sabre and baton. Below are various numbers of gold maple leaves which identify the rank.

Similar to flag officers within the navy structure for admirals and general officers within the army structures, the air ranks or officers categorized the most senior air force ranks similar to today's generals.

- The RCAF rank for Air Commodore (A/C) has no additional ribbon above the thick blue band. The CF rank equivalent is Brigadier-General (BGen), which has one gold Maple leaf.
- The RCAF rank for Air Vice Marshal (A/V/M) has a medium thin blue band above the thick blue band. The CF rank equivalent is Major-General (MGen), which has two gold Maple leaves.
- The RCAF rank for Air Marshal (A/M) has two medium blue bands above the thick blue band. The CF rank equivalent is Lieutenant-General (LGen), which has three gold Maple leaves.
- The RCAF rank for Air Chief Marshal (A/C/M) has three medium blue bands above the thick blue band. The CF rank equivalent is General (Gen), which has four gold Maple leaves.

Using the information above, complete the attached Annexes, titled:

1. ***RCAF Non-Commissioned Ranks Worksheet***
2. ***RCAF Officer Ranks Worksheet***
3. ***RCAF Air Rank (Officer) Ranks Worksheet***
4. ***RCAF-CF Comparison Sheet***

PO 440 – Aerospace Structures

Part 1 – Metals used in Aerospace Construction

Aluminum

Pure aluminum lacks sufficient strength to be used for aerospace construction. However, its strength increases considerably when it is alloyed, mixed with other compatible metals. For example, when aluminum is mixed with copper or zinc, the resultant aluminum alloy is as strong as steel, with only one-third the weight. As well, the considerable corrosion resistance possessed by the aluminum carries over to the newly formed alloy. Aluminum is the most commonly used metal for spacecraft structure.

Magnesium

Magnesium is one of the lightest metals with sufficient strength and suitable working characteristics for use in aerospace structures. That is, in its pure form it lacks sufficient strength but, like aluminum, mixing it with other metals to create an alloy produces strength characteristics that make magnesium useful.

Titanium

Titanium and its alloys are lightweight metals with very high strength. Pure titanium weighs only half as much as stainless steel and is soft and ductile. Titanium alloys have excellent corrosion resistance, particularly to salt water.

Stainless Steel

Stainless steel is a classification of corrosion-resistant steel that contains large amounts of chromium and nickel. It is well suited to high-temperature applications such as firewalls and exhaust system components.

Material Testing

The study of materials used in aerospace construction is vast and growing rapidly as scientists and engineers gain experience using materials in frontier applications and environments. All materials represent opportunity, but they must be correctly used. Space includes a variety of environments, each with different challenges. Materials are selected for use in applications after careful study in laboratories, including laboratories in orbit.

Orbit Environment

The characteristics of a spacecraft's orbit are determined by its mission. Some spacecraft travel between worlds and must be capable of functioning in a variety of conditions. Most spacecraft, however, are used in an application that restricts them to a narrow range of space environments. The relative impact of any of the space environments' effects on materials depends on the type of mission the spacecraft has to perform (eg, communications, defense, Earth observing) and, more important, the orbits in which the spacecraft is placed.

Low Earth Orbit (LEO) extends up to 1000 km. Major space environment hazards in LEO include atomic oxygen, ultraviolet radiation, frequent cycling between hot and cold temperatures, micrometeoroids, debris and contamination.

Atomic oxygen (AO) is an elemental form of oxygen that does not exist in the Earth's atmosphere. In space, however, it is common in the LEO area where satellites orbit the Earth. There, it reacts with other materials very easily and exposes satellites and spacecraft to damaging corrosion. To prevent AO from damaging metal surfaces, protective coatings are applied to the metal's surface. AO flux and ultraviolet radiation interact in the degradation of silver and Teflon materials.

Orbital debris is another hazard for materials in LEO. This refers to man-made particles orbiting the Earth. Within about 2 000 km above Earth's surface there is an estimated 3 000 000 kg of man-made orbiting objects. These particles are a result of standard launch and spacecraft operations as well as rocket and satellite breakups. Impacts can alter material states and expose underlying materials, allowing the space environments to further increase the damage area and begin damaging previously unexposed areas.

Composite Construction

Composite structures differ from metallic structures in important ways: excellent elastic properties, high strength combined with light weight and the ability to be customized in strength and stiffness. The fundamental nature of many composites comes from the characteristics of a strong fibre cloth imbedded in a resin.

Fibreglass

Fibreglass is made from strands of silica glass that are spun together and woven into cloth. Fibreglass weighs more and has less strength than most other composite fibres. However, improved matrix materials now allow fibreglass to be used in advanced composite aerospace applications. There are different types of glass used in fibreglass: E-glass, which has a high resistance to electric current and S-glass, which has a higher tensile strength, meaning that the fabric made from it resists tearing.

Aramid

Aramid is a polymer. A polymer is composed of one or more large molecules that are formed from repeated units of smaller molecules. The best-known aramid material is Kevlar®, which has a tensile strength approximately four times greater than the best aluminum alloy.

Aramid is ideal for aerospace parts that are subject to high stress and vibration. The aramid's flexibility allows it to twist and bend in flight, absorbing much of the stress. In contrast, a metal part would develop fatigue and stress cracks sooner under the same conditions.

Carbon / Graphite

The term carbon is often used interchangeably with the term graphite; however, they are not quite the same material. Carbon fibres are formed at 1315 degrees Celsius (2400 degrees Fahrenheit), but graphite fibres are produced only above 1900 degrees Celsius (3450 degrees Fahrenheit). As well, their actual carbon content differs—but both carbon and graphite materials have high compressive strength and stiffness. Carbon molecules will form long strings that are extremely tough (this is what makes diamonds so strong). Individual carbon fibres are flexible, rather than stiff, and bend easily despite having high tensile strength. To stiffen the fibres, cross-directional layers are immersed in a matrix material such as epoxy plastic. A matrix is any material that sticks them together.

Ceramic

Ceramic fibre is a form of glass fibre designed for use in high temperature applications. It can withstand temperatures approaching 1650 degrees Celsius (3000 degrees Fahrenheit), making it effective for use around engines and exhaust systems. Ceramic's disadvantages include both weight and expense, but sometimes no other known material will do the job. One of the most famous applications of ceramic is the Thermal Protection System (TPS) used on the space shuttle. Thousands of tiles of various sizes and shapes cover a large percentage of the space shuttle's exterior surface. There are two main types of silica ceramic tiles used on the space shuttle:

Low-Temperature Reusable Surface Insulation (LRSI). LRSI tiles cover relatively low-temperature areas of one of the shuttles, the Columbia, where the maximum surface temperature runs between 370 and 650 degrees Celsius (700 and 1200 degrees Fahrenheit), primarily on the upper surface of fuselage around the cockpit.

These tiles have a white ceramic coating that reflects solar radiation while in space, keeping the Columbia cool.

High-Temperature Reusable Surface Insulation (HRSI). HRSI tiles cover areas where the maximum surface temperature runs between 650 and 1260 degrees Celsius (1200 and 2300 degrees Fahrenheit). They have a black ceramic coating, which helps them radiate heat during re-entry.

Both LRSI and HRSI tiles are manufactured from the same material and their primary difference is the coating. A different and even more sophisticated material, Reinforced Carbon-Carbon (RCC), is used for the nose cone and leading edges of the space shuttle. It is a composite material consisting of carbon fibre reinforcement in a matrix of graphite, often with a silicon carbide coating to prevent oxidation.

Answer the following questions on a separate piece of paper, using the information above.

1. Why is pure aluminum unsuitable for use in many applications of aerospace construction?
2. What three characteristics make titanium useful for aerospace components?
3. What method is used to stiffen carbon fibre materials?

Part 2 – Canadian Satellites

Alouette Program

History: Launched on September 29, 1962, the Alouette-I scientific satellite marked Canada's entry into the space age and was seen by many as initiating the most progressive space program of that era. With the Alouette launch, Canada became the first nation after the Soviet and American superpowers, to design and build its own artificial Earth satellite.

Purpose: The development of Alouette-I came as a result of an American invitation, through the newly formed National Aeronautics and Space Administration (NASA) in 1958, for international collaboration in its budding satellite program. This Canadian satellite would monitor the top of the ionosphere, an upper layer of the earth's atmosphere that is ionized by solar wind.

The objectives were twofold, both primary and scientific:

1. Primary objectives were:
   a) to bring Canada into the space age by developing a space capability;
   b) to contribute to space engineering and technology; and
   c) to improve the capability of high frequency (HF) radio communications by studying the ionosphere from above.
2. Scientific objectives were:
   a) to measure the electron density distribution in the ionosphere at altitudes between 300 and 1 000 km;
   b) to study, for a one-year period, the variations of electron density distribution with regard to time of day and latitude under varying magnetic and auroral conditions, with particular emphasis on high latitude effects; and
   c) to determine electron densities in the vicinity of the satellite by means of galactic noise measurement and to make observations of related physical phenomena, such as the flux of energetic particles.

Accomplishments: Alouette-I was a tremendous success. The conservative research approach adopted by the team paid off as the satellite eventually stretched its one-year design life into an unprecedented 10-year mission, producing more than one million images of the ionosphere.

Following the success of Alouette-I, Canada and the United States signed an agreement to launch further satellites under a new program called International Satellites for Ionospheric Studies (ISIS). Under the ISIS program, the Alouette backup model, Alouette-II, was refurbished and flown in 1965 and two new satellites, named ISIS I and ISIS II, were successfully launched in 1969 and 1970 respectively.

Microvariability & Oscillation of Stars (MOST) Mission

History: MOST is Canada's space telescope in orbit. It is sometimes referred to as the "Humble Space Telescope" due to its physical size, despite its effectiveness and accomplishments. The four partners who designed and created MOST are: Canadian Space Agency (CSA),
University of British Columbia (UBC) (Physics and Astronomy), University of Toronto Institute for Aerospace Studies (UTIAS), and Dynacon Enterprises Limited (main contractor, mission operations). The MOST science team includes representatives from various organizations.

MOST was carried aloft aboard a Russian three-stage rocket on June 30, 2003, from a launch site in northern Russia (Plesetsk). MOST was injected into a low-Earth polar orbit at approximately 820 km altitude with an orbital period of approximately 100 minutes in a sun-synchronous mode remaining over the Earth's terminator (the line between day and night).

Purpose: The stated purposes of the MOST space telescope are the detection and characterization of:

- acoustic oscillations in sun-like stars, including very old stars (metal-poor subdwarfs) and magnetic stars (roAp), to probe seismically their structures and ages;
- reflected light from giant exoplanets closely orbiting sun-like stars, to reveal their sizes and atmospheric compositions; and
- turbulent variations in massive evolved (Wolf-Rayet) stars to understand how they add gas to the interstellar medium.

Accomplishments: Although the MOST space telescope is often referred to as the Humble telescope because of its size next to the Hubble Space Telescope (HST), the accomplishments of MOST are anything but humble. The team of scientists and engineers—located from coast to coast across Canada and in Harvard and Vienna—has extended the capabilities of this "little telescope that could" to explore exoplanets (alien worlds around other stars). MOST has measured the properties of several of these planets, which are invisible even to the largest telescopes. Among the findings of MOST is a planet whose atmosphere is either so clear or so hazy that it reflects only four percent of the light it receives from its parent sun.

RADARSAT Program

History: The RADARSAT program was born out of the need for effective monitoring of Canada's waters. Canada is a world leader in the operational use of space radar for sea ice monitoring. Earth-observation satellites have an advantage over aerial surveillance missions. Satellites operate day and night in all weather conditions and provide timely coverage of vast areas. RADARSAT is Canada's first series of remote-sensing satellites. These satellites focus on the use of radar sensors to provide unique information about the Earth's surface through most weather conditions and darkness. A technique known as synthetic-aperture radar (SAR) is used by RADARSAT satellites to increase the resolution of images by taking advantage of the fact that the satellite's small aperture is constantly moving. The many echo waveforms received at the different antenna positions are then post-processed by a computer in order to resolve the target with high definition.

Purpose:

- **Marine Surveillance** Worldwide offshore resource-based operations such as fishing, oil and gas exploration and production have intensified over the past few decades. Government and industry require powerful solutions for assessing the resources and risks associated with the ocean environment. To monitor the world's oceans, Canada has provided radar data for operational applications such as ship detection, oil spill monitoring, and wind and surface-wave field estimation.

- **Disaster Management** Radar satellites are key resources in a variety of disaster management scenarios. The data has been used effectively in disaster responses such as earthquakes, tsunamis, floods, landslides, forest fires, and other natural or technological disasters.

- **Hydrology** Water is one of Earth's most precious and widely used resources. RADARSAT-2 enhances soil moisture measurement, and snow pack monitoring and analysis, while improving the potential for SAR in wetland mapping and discrimination. This will benefit mapping applications involving coastlines, tidal and near-shore terrestrial areas, and near-shore bathymetry (depth measurements).

- **Mapping** Mapping covers a broad range of activities, including the creation of Digital Elevation Models (DEMs), the detection and mapping of centimetre-scale movements at the Earth's surface (InSAR), and the extraction and identification of features to support environment management and security.

- **Geology** Satellite radar data is very useful in geological exploration and mapping activities for petroleum and mineral resources. Canadian radar data is used for both onshore and offshore exploration and mapping and to monitor and detect oil seeps, which reduces the risk and cost of drilling.

- **Agriculture** Abundant harvests and crop yields partly depend on soil dynamics that fluctuate throughout the growing season. Satellite imagery is an efficient method for mapping crop characteristics over large spatial areas and tracking temporal changes in soil and crop conditions.

- **Forestry** With more than 30 percent of the Earth's total land area covered in forests, it is no small feat to assess and monitor forest resources. Satellite imagery is the most efficient method for coverage of forested areas. Several applications in forestry have benefited from Canadian radar data, in particular clear-cut mapping.

Accomplishments:
The RADARSAT Program continues Canada's tradition of providing world leadership in advancing Earth observation technologies and techniques. Natural Resources Canada—one of RADARSAT's main customers —observes that RADARSAT's unparalleled operational flexibility and reliable delivery provides high quality and cost-effective data to researchers and environmental professionals world-wide.

Answer the following questions on a separate piece of paper, using the information above.

1. What was Alouette designed to do?
2. What sort of orbit does MOST have?
3. What kind of satellites are RADARSAT satellites?
4. What are three purposes of the RADARSAT program?