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ROYAL CANADIAN AIR FORCE

DOCTRINE

INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE

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ROYAL CANADIAN AIR FORCE DOCTRINE

INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE

TABLE OF CONTENTS

LIST OF FIGURES iv

PREFACE v

KEYNOTES vi

CHAPTER 1 • INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE 1

Introduction 1
Aim 1
Purpose 2

CHAPTER 2 • FUNDAMENTALS OF ISR 5

Air power characteristics and ISR 6
Principles of air ISR 7
Tenets of air ISR 7

CHAPTER 3 • ISR COMPONENTS, DISCIPLINES AND SYSTEMS 11

Components 11
Disciplines 14
Systems 16

CHAPTER 4 • THE RCAF ISR PROCESS 21

Direction phase 21
Collection phase 22
Processing phase 23
Dissemination phase 25
Integrate and evaluate 25

CHAPTER 5 • ISR AND THE AIR CAMPAIGN 27

ISR participants in an air campaign 27
Planning and executing air ISR in a joint environment 30

CHAPTER 6 • ISR EMPLOYMENT AND MISSIONS 35

Non-crisis and peacetime 35
Pre-conflict 36
Conflict 36
Post-conflict 36
Crisis response operations 36

ANNEX A • SENSOR TYPES 38

ANNEX B • PREDICTIVE BATTLESPACE AWARENESS 40

ANNEX C • SAMPLE RSTA ANNEX FORMAT 42

ANNEX D • ISR SYNCHRONIZATION MATRIX EXAMPLE 43

GLOSSARY 44

ABBREVIATIONS 48

REFERENCES 51

LIST OF FIGURES

Figure 1-1. Decision superiority model 1
Figure 3-1. The RCAF ISR enterprise 11
Figure 4-1. The ISR process 21
Figure 5-1. AOC ISR processes and deliverables during the air tasking cycle 29
Figure 5-2. The joint-level ISR planning process 31
Figure 5-3. ISR air component planning 32
Figure 5-4. ISR mission design 32
Figure 5-5. ISR mission execution 33
Figure 5-6. ISR mission assessment 33

PREFACE

This manual provides the operational-level doctrine for the core Royal Canadian Air Force (RCAF) capability of intelligence, surveillance and reconnaissance (ISR). While intended primarily for the operational level, it also describes fundamentals applicable at the strategic and tactical levels. This manual has been designed for use by RCAF personnel and units engaged in the planning and execution of ISR operations, including defining and managing information requirements, coordinating and executing information collection as well as processing and assessing the collected data.

This manual is presented in six chapters:

a. **Chapter 1 – Intelligence, Surveillance and Reconnaissance.** Describes how ISR provides information regarding elements that a commander does not control, such as enemy and terrain. It also introduces the concept that ISR, like all RCAF roles, is centrally controlled and decentrally executed.

b. **Chapter 2 – Fundamentals of ISR.** Provides a definition of ISR and relates this capability to the tenets and characteristics of air power.

c. **Chapter 3 – ISR Components, Disciplines and Systems.** Describes the three main areas of ISR and their sub-elements.

d. **Chapter 4 – The RCAF ISR Process.** Details the four phases of the ISR cycle: direction, collection, processing and dissemination.

e. **Chapter 5 – ISR and the Air Campaign.** Introduces the major ISR participants in planning and executing an air campaign and details their particular function in the air tasking cycle.

f. **Chapter 6 – ISR Employment and Missions.** Describes how ISR is utilized in the various phases of a conflict: from peace to war to post-conflict. Lists types of sensors used in collection and provides examples of the tools used to conduct ISR planning and operations.

The manual supersedes B-GA-402-000/FP-001, *Canadian Forces Aerospace Sense Doctrine*, 1st Edition, August 2012, and is to be used in conjunction with the following RCAF doctrine:[1]

a. B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine*;

b. B-GA-402-001/FP-001, *Royal Canadian Air Force Doctrine: Command and Control*;

c. B-GA-403-002/FP-001, *Aerospace Electronic Warfare Doctrine*; and

d. B-GA-405-000/FP-001, *Canadian Forces Aerospace Shield Doctrine*.

Recommendations for amendments to this publication are welcome and should be forwarded to the Royal Canadian Air Force Aerospace Warfare Centre, attention: Doctrine Development Branch.

The Commander 1 Canadian Air Division is the approval authority for this doctrine.

1. RCAF doctrine is available on the DIN at http://w08-ttn-vmweb01/CFAWC/en/index.asp and on the Internet at http://www.rcaf-arc.forces.gc.ca/en/cf-aerospace-warfare-centre/aerospace-doctrine.page.

KEYNOTES

These keynotes are the fundamental beliefs upon which this doctrine publication is built.

- Intelligence, surveillance and reconnaissance (ISR) operations are a joint responsibility and key enabler to all other military operations and campaigns. Ultimately, ISR contributes directly to decision superiority, providing commanders and decision makers with timely and relevant information that supports the building of common and shared knowledge and understanding of the operational environment. While a joint operation, air power's distinct qualities and attributes render it ideally suited for ISR missions.

- While coordination and identification of requirements occur at the joint level, detailed planning and execution of the air ISR campaign is an Air Force function.


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CHAPTER 1

INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE

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INTRODUCTION

Intelligence, surveillance and reconnaissance (ISR), a core capability of the Royal Canadian Air Force (RCAF), is conducted using an increasing number of air platforms, ground systems and support organizations.

These high-demand, low-density ISR systems and the wealth of data that they deliver require effective management and processing to reap the maximum benefit to operations. This publication describes the characteristics and essential elements of ISR and provides a framework for RCAF ISR methodologies as well as related tactics, techniques and procedures (TTP).

AIM

To conduct effective campaigns and operations, commanders at all levels require knowledge of the operational environment. This includes both those elements they control, such as friendly forces and terrain they inhabit, as well as those they do not, such as adversary forces, weather, foreign terrain and the associated human terrain. As depicted in Figure 1-1, when this knowledge is integrated into the overall operational picture and its implications are understood, it enables the commander to have situational awareness and acquire an advantage over the adversary through understanding and potential decision superiority.[1]

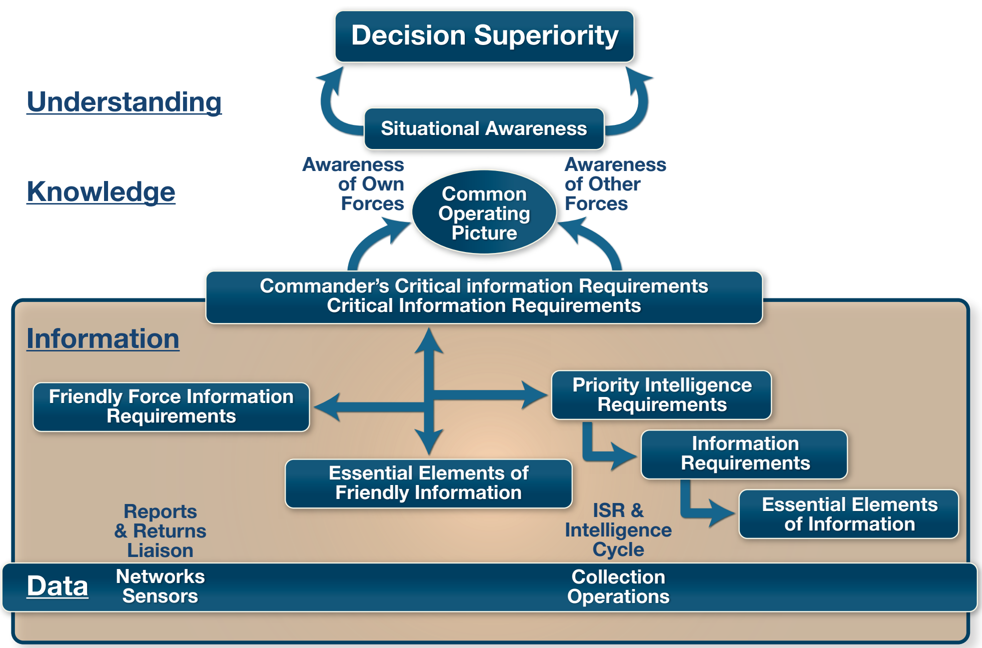

Figure 1-1. Decision superiority model[2]

1. For a more detailed description of this concept, refer to Canada, Department of National Defence, B-GA-402-000/FP-001, *Canadian Forces Aerospace Sense Doctrine* (August 2012), accessed November 3, 2015, http://www.rcaf-arc.forces.gc.ca/en/cf-aerospace-warfare-centre/doctrine/b-ga-402-000-fp-001.page.
2. Ibid., 7.

Those elements of information that a commander does not control are the focus of this document. Specifically, it will describe how a commander determines the information required and how the commander tasks forces to collect and report it. This is the ISR process.

PURPOSE

In modern military operations, there is an increasing appetite for information, whether real or near real time, focused or pan-theatre. The key air-force charac-

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teristics of speed, reach and elevation make air power a natural choice to feed this demand. Thus, ISR has become a core capability of the RCAF in its support of joint operations.

The RCAF directs its ISR operations using a central air operations centre while devolving the execution of the ISR missions to individual units. This manual describes the fundamental aspects of ISR operations and the conduct of centralized air-force management and decentralized execution of ISR activities. It will also highlight and describe the components and elements required for air force ISR.

CHAPTER 2

FUNDAMENTALS OF ISR

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Intelligence, surveillance and reconnaissance (ISR) has come to mean more than its individual components. ISR brings "the three components into a coherent whole to provide a framework for selecting, tasking and coordinating collection assets."[1] Furthermore, ISR encompasses the numerous activities and assets related to information collection, the entity that designs and generates related capabilities as well as the structure around which the various processes of direction, collection, processing and dissemination reside.

ISR is "an activity that synchronizes and integrates the planning and operation of all collection capabilities with exploitation and processing to disseminate the resulting information to the right person, at the right time, in the right format, in direct support of current and future operations."[2]

ISR is a joint capability. Royal Canadian Air Force (RCAF) ISR is part of multi-environment and multi-agency effort to gain situational awareness (SA) and subsequent decision superiority in support of Canada's national strategy. Therefore, the RCAF conducts ISR not just in support of its own requirements, but also those of the entire government. Conversely, the RCAF uses information and intelligence provided by other defence and government ISR agencies to enhance its own ISR operations.[3] Because of this interaction, RCAF ISR systems must be interoperable with those of the entire joint force.

Characteristics of Airborne ISR

Elevation

Fragility

Impermanence

Payload

Precision

Reach

Speed

Stealth

The Canadian Armed Forces and its allies operate under stringent engagement criteria that dictate the use of weapons that are increasingly precise. Add to this an adversary that has become harder to detect through either technology or the unconventional nature of their forces and techniques, and it becomes clear that a detailed and highly accurate intelligence supported by robust ISR is necessary.[4]

While essential in times of conflict, ISR is also critical to peacetime operations. ISR supports SA for sovereignty operations, building intelligence databases, guiding tactics development, assisting capability development as well as providing indications and warning.[5]

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1. United Kingdom Ministry of Defence, Royal Air Force (RAF), *Intelligence, Surveillance & Reconnaissance (ISR) Primer* (RAF Waddington: Air Warfare Centre, 2011), 1-3.

2. *Defence Terminology Bank* (*DTB*) record 30966.

3. Australia, Royal Australian Air Force (RAAF), Australian Air Publication (AAP) 1001.3, *The Air Force Approach to ISR* (Canberra: Air Power Development Centre, 2011), accessed November 3, 2015, http://airpower.airforce.gov.au/Publications/Details/461/AAP-1001.3-The-Air-Force-Approach-to-ISR.aspx, 2-2–2-3.

4. Ibid., 2-11.

5. Ibid., 2-13.

AIR POWER CHARACTERISTICS AND ISR

The distinct qualities and attributes of air power[6] also apply to air ISR. Air power characteristics such as reach and speed greatly enhance the overall ISR mission. However, they must be balanced against characteristics such as fragility and impermanence.

a. **Elevation.** Employing sensors from altitude allows them to observe and gather data from much greater distances than from the surface. This elevated perspective and increased range of detection also allows for stealth and safety of the platform because of increased stand-off range.

b. **Fragility.** Air platforms are generally more fragile than surface platforms, as they are more susceptible to enemy contact and environmental effects. In particular, most dedicated ISR platforms have minimal self-defence capability and would not be effective in contested airspace. Therefore, high-cost and scarce ISR platforms must be employed judiciously in threat environments.

c. **Impermanence.** Air ISR platforms cannot remain aloft indefinitely. Therefore, an air operations centre must prioritize, assign and synchronize multiple platforms to provide permanent airborne coverage of an area or target.

d. **Payload.** The limited payload capabilities of some air platforms will restrict the number and size of sensors they can carry. Multiple sorties and the ability to quickly place a sensor in a required area of coverage can compensate for this constraint.

e. **Precision.** Air power can be employed with great accuracy and minimal collateral damage because of capabilities provided by precision guided munitions and ISR systems.

f. **Reach.** Air platforms are able to cover relatively long distances in a short period. This allows the employment of airborne ISR throughout a theatre, thus granting a commander flexibility and pervasiveness of collection missions.


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6. Canada, Department of National Defence, B-GA-400-000/FP-000, *Canadian Forces Aerospace Doctrine* (December 2010), 25, accessed November 3, 2015, http://www.rcaf-arc.forces.gc.ca/en/cf-aerospace-warfare-centre/doctrine/b-ga-400-000-fp-000.page.

g. **Speed.** The inherent speed of air ISR platforms provides a rapid dispatch or retask of a sensor to an area of interest. The highly networked and integrated nature of the ISR system allows ISR missions to be planned and executed dynamically, enabling time-sensitive decision making.[7]

h. **Stealth/discreetness.** Being able to gather data from a distance and high elevation gives airborne ISR platforms the ability to collect data while remaining undetected. Therefore, an adversary may operate under the misconception they are unobserved, thus giving friendly forces the element of surprise and information superiority. Conversely, the presence of an airborne ISR asset in an overt posture may deter certain adversary actions.

PRINCIPLES OF AIR ISR

Command-led. ISR is an integrated activity that combines operations, intelligence and plans. Such integration can only be achieved through common purpose and coordination reinforced by command leadership. Furthermore, collection operations are centrally coordinated to obtain optimum efficiencies and harmonize the efforts of the entire ISR process.[8]

Network-enabled. Effective ISR can only be realized through a flexible, integrated and accessible network of sensors, processes, assets and databases, including RCAF platforms that serve as nodes in this network, delivering and receiving information on demand. This network, or system-of-systems, should provide the means to not only collect, integrate, analyse and disseminate information but also access information and intelligence from other formations, strategic collection systems as well as national and multinational sources and agencies.[9]

Versatile sensor mix. The provision of a robust mix of sensor capabilities provides flexibility and multisource corroboration. It also enables cross-cueing, which entails one sensor passing detection, geolocation and targeting information to another sensor, which improves efficiency. The packaging of collection assets should be modular and adaptive so that they can be tailored to meet the needs of the mission.[10]

Tenets of Air ISR

Priority
Integration
Accuracy/relevance
Timeliness
Fusion
Persistence
Pervasiveness
Layered
Accessibility
Security

TENETS OF AIR ISR

There are 10 tenets of air ISR that serve as a guide to reduce risks and enhance the capacity of ISR systems.[11]

a. **Priority.** ISR technology has advanced exponentially over the last two decades. Nevertheless, "the requirement for ISR generally exceeds the number of systems available."[12]

7. AAP 1001.3, *The Air Force Approach to ISR*, 2-28.
8. B-GA-402-000/FP-001, *Canadian Forces Aerospace Sense Doctrine*, 34.
9. Ibid.
10. Ibid.
11. AAP 1001.3, *The Air Force Approach to ISR*, 2-16.
12. *ISR Primer*, 1-2.

Moreover, these advances have favoured collection as opposed to processing, exploitation and dissemination.[13] This has resulted in collected data being limited by a processing capability that is only able to handle a fraction of it effectively. This imbalance requires command-directed prioritization and management of the ISR effort.

b. **Integration.** Intelligence enables operations, and operations drive intelligence requirements. ISR is at the intersection of these two functions.[14] A close relationship between the ISR process and strategy, planning and execution will enhance information flow and allow for focused and efficient ISR operations.[15]

c. **Accuracy and relevance.** An ISR system must be able to deliver accurate data and information to support the precise nature of modern operations and to establish and maintain reliability. This same information must be delivered in a relevant format and in time to meet the requester's specified needs.

d. **Timeliness.** The ISR system must be able to deliver information within the period required by the decision maker. Therefore, the ISR cycle must be synchronized with the air tasking cycle or the appropriate operations cycle.[16] There are two factors in determining the potential timeliness of an ISR system:

   (1) **Response time** is the time between the initiation of an information requirement (IR) and the receipt of an answer. Mission planning and transit time add to the response time.[17]

   (2) **Reporting time** is the lapsed time between a source collecting an item of data and its reception, in the desired format, by a user. The optimal solution would be for the ISR product to be delivered in real or near real time. However, there may be a requirement to recover a sensor to a location where it can transmit its report, or the information may have to be downloaded and processed to make it intelligible and available for transmission.[18] Inevitably, reporting time will be influenced by the robustness of the communications architecture and the bandwidth capacity for data transmission. Nevertheless, the usefulness of a voice tactical report early in the process should not be undervalued and is sometimes preferable to a compiled graphic product.

e. **Fusion.** An ISR system enhances SA if it uses a synergistic blend of information from multiple sources. This approach optimizes strengths and minimizes weaknesses inherent in single information sources.[19] Multiple-source analysis also helps counter adversary denial and deception efforts.[20] However, fusion should not be promoted at the expense of timeliness, especially when the fidelity and validity of a single source is well proven.[21]

13. AAP 1001.3, *The Air Force Approach to ISR*.
14. Ibid., 2-7.
15. Ibid.
16. Ibid., 2-17.
17. *ISR Primer*, 2-4.
18. Ibid.
19. CFJP 2-0, *Intelligence*, 2-3.
20. AAP 1001.3, *The Air Force Approach to ISR*, 2-18.
21. *ISR Primer*, 1-4.

f. **Persistence.** An ISR system must be able to provide sustained coverage of a target in the operational environment. This denies the adversary freedom of movement and facilitates positive identification. To provide persistent coverage with air platforms that are inherently impermanent requires synchronizing multiple collection assets over one target.[22]

g. **Pervasiveness.** ISR must be able to permeate the adversary's structure in order to detect mobile and concealed targets. Adversary targets range from traditional weapon systems and fixed infrastructure to individuals well integrated into the larger population. Adversaries may also use deception, camouflage and concealment to thwart collection and cause the unnecessary expenditure of munitions. This necessitates having a broad array of ISR platforms and sensors.[23]

h. **Layered.** Where possible, more than one source should be used to collect against the same IR. Preferably, the multiple sources would operate in different parts of the electromagnetic spectrum or use different collection media, while taking care to avoid mutual interference.[24] Layering will allow one sensor to cue others for detailed coverage or offset the weakness of one with the strength of another.[25] Multiple sensors also provide collateral sources of data that help counter an adversary's deception measures.

i. **Accessibility.** ISR requires robust, secure communications to pass potentially large amounts of data and information throughout the entire system. The network upon which this communication relies must be resilient, reliable, effective and available to ensure the delivery of timely information. Additionally, ISR-derived information and intelligence must be effectively and efficiently disseminated as well as made accessible to, and searchable by, those who need it.[26]

j. **Security.** ISR capabilities, sources and methods must be appropriately protected while still ensuring ISR data, information and intelligence are delivered when and where they are needed.[27] ISR is critically dependent upon the ability to securely and safely operate within the cyber environment. Networks and platforms must be appropriately protected from any number of threats, including kinetic and cyberattacks as well as electronic warfare. Additionally, sound operational security measures must be implemented in support of ISR missions to deny the adversary knowledge of friendly ISR dispositions, capabilities and intentions.[28]


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22. AAP 1001.3, *The Air Force Approach to ISR,* 2-18–2-19.
23. Ibid., 2-19.
24. *ISR Primer*, 2-4.
25. AAP 1001.3, *The Air Force Approach to ISR*, 2-20–2-21.
26. Ibid., 2-22.
27. Ibid., 2-23.
28. Ibid.

CHAPTER 3

ISR COMPONENTS, DISCIPLINES AND SYSTEMS

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As depicted in Figure 3-1, the Royal Canadian Air Force (RCAF) intelligence, surveillance and reconnaissance (ISR) enterprise comprises three groups: components, disciplines and systems. Successful ISR results from an integrated interaction of all of these groups.[1]

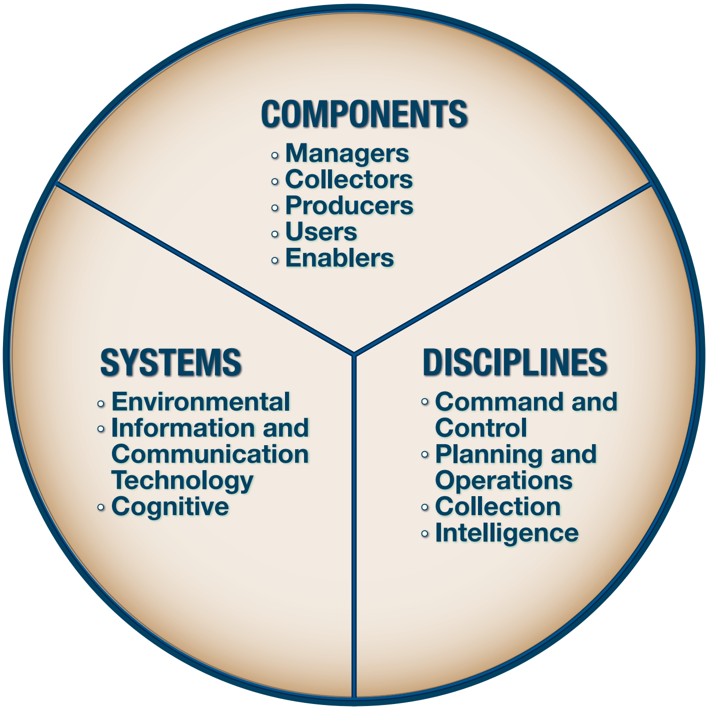

Figure 3-1. The RCAF ISR enterprise

COMPONENTS

The RCAF ISR enterprise comprises a number of components, including managers, collectors, producers, users and enablers. The components comprise elements that can be equipment, organizations or individuals. Subject to their role, responsibility and capability, an element can be a manager, collector, producer, user or enabler at different times.[2]

Managers are those RCAF organizational elements responsible for running aspects of the ISR enterprise. They comprise the following:

a. **Chief of the Air Force Staff (C Air Force)** is responsible for managing the development of RCAF ISR policies, plans and programmes. C Air Force also ensures the RCAF ISR enterprise is appropriately resourced and prioritized.

b. **1 Canadian Air Division (Cdn Air Div)** generates, sustains and employs ISR components and systems within all disciplines of RCAF operational ISR.

1. AAP 1001.3, *The Air Force Approach to ISR*, 3-1.
2. Ibid., 3-1–3-2.

c. **2 Cdn Air Div** manages training to force generate components within all disciplines of RCAF ISR systems.[3]

d. **Air operations centre (AOC).** The 1 Cdn Air Div AOC is responsible for planning, synchronizing, coordinating and tasking airborne ISR.[4]

e. **Wings** are responsible for generating operational ISR capabilities, through components and systems, for missions assigned to their units in the air tasking order (ATO).

f. **Units.** Squadrons and units manage components at the tactical level through the execution of ISR disciplines and employment of ISR systems.

Collectors. Collectors are the people, platforms and sensors that are involved in the collection of ISR data.[5]

Producers. Producers are those entities that produce information and intelligence from ISR operations[6] and comprise the following:

a. **Fusion node.** An organization that synergistically blends information from multiple sources to enhance situational awareness.[7]

b. **Analysis node.** An organization that analyses and exploits ISR data and information and produces intelligence as part of the intelligence cycle.[8]

c. **Air operations centre.** The AOC provides tailored information and intelligence products to the joint commander, joint force air component commander and subordinate elements.[9]

d. **Units.** Intelligence and operational support units produce specific ISR products as part of their core function, whereas others—such as combat or engineer units—may produce ISR products as a secondary function.[10]

Users are those elements that receive and use ISR products. "ISR supports a diverse set of 'users' ranging from national agencies at the strategic level through to sub-unit-level decision makers at the tactical level"[11] as follows:

a. **Commanders** at all levels use information and intelligence to enhance their battlespace awareness, ensure information superiority and, thus, achieve decision superiority.[12]

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3. "2 Canadian Air Division," Canada, RCAF, accessed November 3, 2015, http://www.rcaf-arc.forces.gc.ca/en/2-cdn-air-div/index.page.

4. AAP 1001.3, *The Air Force Approach to ISR*, 3-4.

5. Ibid., 3-4.

6. Note that some collectors, such as crew on multi-sensor aircraft or at a ground control station, may have the ability to produce information.

7. AAP 1001.3, *The Air Force Approach to ISR*, 3-4.

8. Ibid., 3-5.

9. Ibid.

10. Ibid.

11. *ISR Primer*, 1-3.

12. AAP 1001.3, *The Air Force Approach to ISR*, 3-6.

b. **Operators** are personnel at the operational and tactical levels that are involved in planning, controlling and executing military operations. They are principal users of ISR products.[13]

c. **Weapons systems** use ISR products either directly or indirectly for navigation, sensor updates and terminal guidance.[14]

d. **Producers** use ISR data and information to produce intelligence.[15]

e. **Strategic/national levels.** Military and other government organizations use ISR products for their all-source analysis, strategic decision making as well as capability planning and management. ISR data and information are also provided to allies and coalition partners.[16]

Enablers. An enabler supports the conduct of ISR operations. Enablers comprise:[17]

a. **Command and control (C2)** elements, the mechanism that binds the people, systems and processes necessary for the RCAF ISR enterprise to operate effectively.[18] This binding also allows the joint coordination of collection assets so as to avert disparate organizations replicating each other's efforts.[19]

13. Ibid.
14. Ibid.
15. Ibid.
16. Ibid.
17. Ibid.
18. Ibid.
19. *ISR Primer*, 1-4.


CAF Photo

b. **People.** Although ISR is heavily reliant on technology, it requires the cognitive abilities of trained personnel throughout its processes. People provide direction to instigate the process, interpret the direction into collection tasks, operate the collection systems and interpret the collected data. The human-dimension requirements of ISR capability development and management are often underestimated or poorly quantified, which usually leads to collection capacity exceeding analysis capacity.[20]

c. **Communications.** ISR depends on a robust, secure communications network built around common standards that can pass data, information and intelligence to users when and where they need it.[21] This includes storage media, network access points and the connectivity between them as well as the hardware and software security measures in place to protect the integrity of the network.

DISCIPLINES

ISR requires various disciplines working in collaboration to fulfil its mission. The disciplines are contained within the core activities of the ISR process: C2, planning and operations, collection and intelligence.[22]

Command and control. Effective C2 requires skilled application of leadership, management and communications. In combination, they support the effective exercise of authority and direction over the ISR process. Adept C2 will generally cascade into more productive activities within the rest of the ISR enterprise.

20. AAP 1001.3, *The Air Force Approach to ISR*, 3-7.
21. Ibid.; and CFJP 2-0, *Intelligence*, 4-9.
22. AAP 1001.3, *The Air Force Approach to ISR*, 3-8–3-9.

Planning and operations. ISR planning consists of translating a commander's direction via stated knowledge requirements into missions and tasks for collection assets.[23] This activity requires specific operational/technical knowledge and skill sets to develop a synchronized and integrated plan that will satisfy the information requirements of the appropriate decision makers.[24]

ISR operations comprise those activities involved in the actual conduct and execution of ISR missions. These include activities in the AOC and at the unit operating the collection platforms and associated sensors.[25]

Collection. Air ISR uses a number of collection disciplines including:

a. **Geospatial intelligence (GEOINT)** is the intelligence derived from the exploitation and analysis of topographical, imagery (still or full motion video), geospatial, meteorological and oceanographic information.[26]

b. **Signals intelligence (SIGINT)** is individual or multi-sensor intelligence derived from communications intelligence, electronic intelligence and foreign instrumentation signals intelligence.[27]

c. **"Measurement and signature intelligence (MASINT)** is scientific and technical intelligence that detects, locates, tracks, identifies and describes the unique characteristics of … target sources. MASINT works on the principle that everything on the earth's surface leaves a form of signature that is measurable in some way. MASINT capabilities include radar, laser, optical, infrared, acoustic, nuclear,"[28] hyper/multi-spectral, biometric and geo-physical.

d. **Human intelligence (HUMINT)** is that intelligence derived from information collected from, and provided by, human sources. Included in this discipline is document and media exploitation such as adversary maps and publications.[29]

Each collection discipline has its own strengths and weaknesses, making layering of sensors vitally important. For example, GEOINT can provide very accurate identification and location data but has limited capacity to provide insight into a target's intentions. By contrast, SIGINT has a limited capacity to locate a target precisely but can provide accurate insight into its intentions. A combination of these elements will often be necessary for a target to be positively identified and legally engaged.[30]

Intelligence is the product resulting from the analysis, integration and interpretation of available information that contributes to the understanding of an actual or potential operating environment. It is a critical input to and consumer of ISR output. It

23. Canada, Department of National Defence, B-GJ-005-500/FP-000, Canadian Forces Joint Publication (CFJP) 5.0, *The Canadian Forces Operational Planning Process (OPP)* Change 2 (2008), 1-8.

24. AAP 1001.3, *The Air Force Approach to ISR*, 3-12.

25. Ibid., 3-13.

26. CFJP 2-0*, Intelligence* 2-6.

27. Ibid., 2-7.

28. *ISR Primer*, 2-2.

29. CFJP 2-0, *Intelligence*, 2-7.

30. AAP 1001.3, *The Air Force Approach to ISR,* 3-12.

not only identifies the knowledge gap that drives ISR collection but also analyses the resulting exploited information. Intelligence should be processed from information obtained through as many independent sources as possible within the context of time and resources available.[31] Intelligence comprises three broad categories:[32]

a. **Basic intelligence** is background intelligence knowledge that is assembled and maintained in databases.[33] It is used as a baseline against which to compare new data and information in order to determine whether there is a change to an adversary's disposition or intentions. It is also the starting point for intelligence estimates and intelligence preparation of the operational environment.

b. **Estimative intelligence** "provides a forward-looking assessment and predictive judgment about future foreign developments, potential courses of action and their implications."[34]

c. **Current intelligence** is "time-critical, perishable intelligence about the current situation and events that has undergone limited analysis."[35]

SYSTEMS

ISR systems comprise the various platforms, sensors, exploitation and analytical systems, capabilities as well as networks that support the RCAF ISR enterprise. The term "system" reflects the understanding that a platform by itself only constitutes a means of carriage, and it is only when integrated with the various other on-board and off-board components that a platform represents an effective weapon system.[36] An ISR system's effectiveness depends on its ability to "plug and play" with a wide variety of users. Connectivity and interoperability are therefore crucial to the responsiveness and survivability of ISR systems and essential to their ability to share accurate, useable and timely information between a variety of users.[37] An ISR system usually comprises:

a. a platform and operating crew;

b. collection sensors;

c. command, control and communications equipment and personnel;

d. mission-planning and tasking equipment and personnel;

e. processing, exploitation and dissemination equipment and personnel; and

f. logistics, training and maintenance support.[38]

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31. *ISR Primer*, 2-5.
32. AAP 1001.3, *The Air Force Approach to ISR*, 3-13.
33. CFJP 2-0, *Intelligence*, 2-4.
34. *DTB* record 43614.
35. *DTB* record 3980.
36. AAP 1001.3, *The Air Force Approach to ISR*, 3-14.
37. *ISR Primer*, 1-5.
38. AAP 1001.3, *The Air Force Approach to ISR*, 3-14.

CAF Photo

ISR systems comprise three groups: environmental, information and communication technology (ICT) and cognitive.[39]

Environmental systems, listed below, are those that reside or operate in a particular physical environment.

a. **Space-based systems** operate greater than 100 kilometres above the earth's surface[40] and are generally capable of providing worldwide coverage, especially of denied areas that airborne or ground-based ISR platforms and sensors cannot penetrate. However, weather and orbital mechanics can limit the effectiveness of space-based systems.[41] Additionally, their schedules are predictable, thus making them vulnerable to denial and deception practices, including emission controls and camouflage. Moreover, they are difficult to access if they require repair.[42]

b. **Unmanned aircraft systems** include the necessary equipment, network and personnel to operate unmanned aircraft (UAS).[43] UAS are classified into tiers according to their take-off weight and have various operating altitudes, different ranges and performance characteristics.[44] Of note, there are UAS that operate with various levels of autonomy, thus belying the term "unmanned." Like robots, UAS are ideally suited for collection missions that are long and tedious (dull), hazardous to humans (dangerous) or are carried out in undesirable conditions (dirty).

39. Ibid.

40. Known as the Karman Line, named after renowned Hungarian physicist Theodore Von Karman (1881–1963).

41. AAP 1001.3, *The Air Force Approach to ISR*, 3-18–3-19.

42. *ISR Primer*, 2-8.

43. *DTB* record 44145.

44. North Atlantic Treaty Organization (NATO) ATP-3.3.7.1, *UAS Tactical Pocket Guide,* Ed. A, Vers 1 (Brussels: NATO Standardization Agency, April 2014), 1-2.

c. **Inhabited aircraft systems** may include traditional ISR aircraft such as those with dedicated ISR sensor suites and non-traditional ISR aircraft such as fast jets with targeting pods capable of capturing ISR data.[45] Increasingly, technology blurs the line between specialist and non-specialist ISR aircraft.[46] Inhabited ISR aircraft are generally flexible and responsive assets often capable of on-board processing and providing real-time data through data link or voice.[47]

d. **Ground-based systems** are either fixed or mobile and may include microwave air defence or high-frequency air and surface-surveillance radars, processing infrastructure as well as space C2 infrastructure.[48] They have the advantage of flexibility, can be deployed as organic capabilities to the lowest tactical level and can be hardened to give them a high degree of survivability. The platforms are generally capable of operating at all times and under all weather conditions, although the sensors themselves may be limited in this respect. However, the sensors are often limited by terrain screening; thus, coverage may be constrained by location and, unless located on high ground, often have limited range.

e. **Surface-based systems** are those where the platform floats on the surface of water, such as a ship or a maritime platform. Surface-based platforms have significant presence and persistence and may include not only a range of sensors to allow cross-correlation but also a significant integrated processing element.[49]

f. **Subsurface-based systems** are either fixed or mobile under water, such as submarines, fixed acoustic sensors and remotely operated submersibles. Subsurface ISR systems have significant penetration capabilities and rely on stealth for operational effectiveness.[50]

ICT systems provide the critical and automatic processing capacity to process and transmit ISR data, information and intelligence. There are two types of ICT systems: communication and computation. Communication systems provide the ability of the ISR enterprise to pass data, information and intelligence quickly and efficiently between the various components. Computation systems are those computer systems that provide the necessary means to process and analyse data and information.[51]

The ISR enterprise is dependent upon the highly volatile and contested cyber environment. A defensive cyber posture focused on information assurance will increase the confidence of ISR data by protecting and defending ICT systems to ensure their availability, integrity, authentication, confidentiality and non-repudiation. ISR requires adequate bandwidth and radio-frequency spectrum to transmit information and intelligence throughout the force as required. ISR planners must, therefore, liaise with communications planners regarding the allocation and tasking of sufficient bandwidth and radio-frequency spectrum.[52]

45. AAP 1001.3, *The Air Force Approach to ISR*, 3-18.
46. *ISR Primer*, iv.
47. B-GA-400-000/FP-000, *Canadian Forces Aerospace Doctrine*, 45.
48. AAP 1001.3, *The Air Force Approach to ISR*, 3-19.
49. Ibid.
50. Ibid.
51. Ibid., 3-19–3-20.
52. Ibid., 5-5.

Cognitive systems represent the human dimension within ISR. They entail the integration of the human mind in receiving, interpreting and acting on information during the processing and exploitation of data, information and intelligence.[53]

CAF Photo

53. Ibid., 3-20.

CHAPTER 4

THE RCAF ISR PROCESS

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The cyclical intelligence, surveillance and reconnaissance (ISR) process, illustrated in Figure 4-1, consists of a network of interrelated, simultaneous phases that mirror the direction, collection, processing and dissemination phases of the intelligence cycle. The output of the process is actionable information that enables decision making at all levels of command.[1]

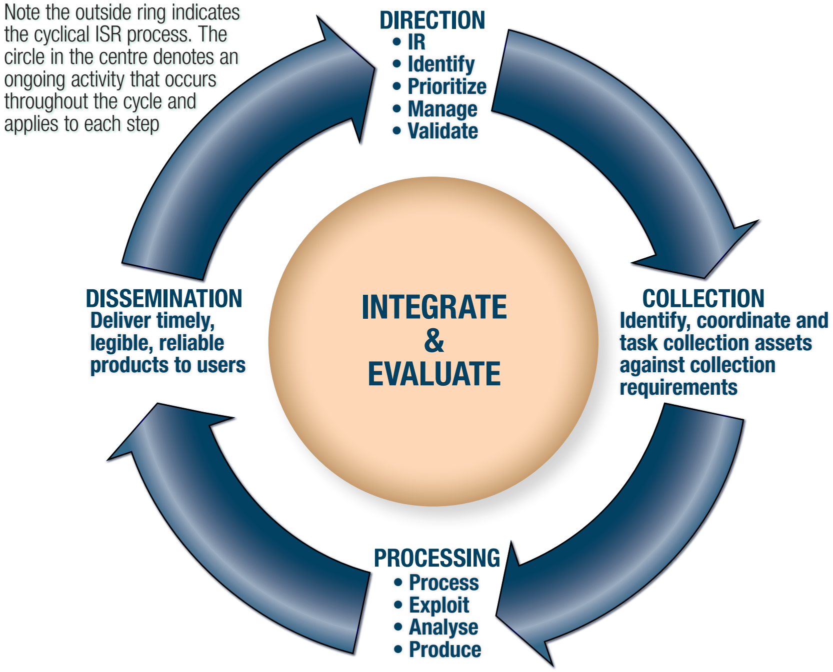

Figure 4-1. The ISR process

DIRECTION PHASE

The first phase of the ISR process is direction. The commander issues direction regarding information requirements (IR) to ensure ISR platforms and sensors are positioned and synchronized to realize the intended degree of battlespace awareness. Further, this direction provides guidance for establishing measures of effectiveness that will be used to verify the success of the ISR operations.[2]

Commander's critical information requirements (CCIR). The direction phase begins during the operational planning process, during which the commander identifies the IR considered crucial to decision making and the successful execution of operations; these are the CCIR.[3] They are the commander's tools for prioritizing and focusing the data- and information-processing activities.[4] CCIR consist of three parts: priority intelligence requirements (PIR), friendly force information requirements and essential elements of friendly information. ISR is solely concerned with addressing PIR.

1. AAP 1001.3, *The Air Force Approach to ISR*, 5-1.
2. Ibid., 5-5.
3. *Defence Terminology Bank* (*DTB*) record 41494.
4. B-GA-400-000/FP-000, *Canadian Forces Aerospace Doctrine*, 11.

PIR drive the ISR process. They are those intelligence requirements for which a commander has an anticipated and stated priority in planning and decision making.[5] PIR are subdivided into a set of more detailed questions known as IR and essential elements of information. Of note, IR are generated by both the command-driven PIR and subordinate-unit requests for information (RFIs), all of which are prioritized for collection at a collection management board.

Request for information. The other source of IR is the RFI, which a lower or adjacent command or unit generates when it has an IR that it cannot answer with its organic resources.

Information requirements management. The responsible ISR entity assembles all these IR and scrutinizes them to determine whether:

a. they are at odds with the commander's concept of operations;

b. the information has already been acquired but not distributed; or

c. there are other ongoing operations that might satisfy the requirement.[6]

If any one of the above conditions is met, new ISR missions may not be necessary. However, once an IR is validated, it becomes a collection requirement (CR) and the ISR planning process begins.[7]

COLLECTION PHASE

The collection phase identifies, coordinates, tasks and positions ISR assets or resources against prioritized CRs.[8] The process addresses factors such as the availability of ISR assets, platform and sensor capabilities, adversary threats to ISR assets as well as timeliness of the ISR response.[9]

Collection managers first determine if organic or assigned ISR assets are capable of satisfying the requirement. If such assets are available, then the appropriate unit will be tasked. If such assets are not available, then the IR will be forwarded as an RFI to be included in its collection management process.[10]

The nature and success of this phase requires an integrated staff approach. This is critical in deconflicting asset availability with IR. Furthermore, the collection plan must be communicated throughout the force, thus ensuring all elements understand the IR of commanders and the ISR tasking that is, or is scheduled to be, conducted. This facilitates an increase in the potential user base for the collected and processed ISR outputs and allows commanders not allocated dedicated ISR to determine if ISR missions planned in support of others have the potential to enhance their own situational awareness (SA).[11]

"Each level of command controls its own set of collection assets, but advances in technology and the nature of operations mean that IR at each level of command

5. *DTB* record 1105.
6. AAP 1001.3, *The Air Force Approach to ISR*, 5-7.
7. Ibid.
8. Ibid., 5-8.
9. Ibid.
10. Ibid., 5-9–5-10.
11. Ibid., 5-10.

may be met by collection assets at more than one level. For example, strategically controlled imagery-intelligence and signals-intelligence sensors can produce a wealth of tactical information, while human intelligence (HUMINT) collection assets controlled at the tactical level can report on activities that have strategic and political importance."[12] Similarly, with knowledge of the information needs of all commanders, ISR planners are able to task assets in support of multiple commanders, thereby optimizing asset employment and increasing ISR efficiency.[13]

Collection management is not just a pre-mission function. Changing situations may require that ISR assets be dynamically retasked to support new mission requirements. The advantages and disadvantages of retasking should be carefully considered before deciding to divert assets from their planned mission. The parameters under which dynamic tasking takes place are a part of the ISR plan.[14]

PROCESSING PHASE

The processing phase entails the transformation of data collected during the collection phase into information that can be disseminated directly to users for immediate use, or further analysed and exploited to produce intelligence.[15]

This phase comprises four sub-phases: process, exploit, analyse and produce. The sub-phases are distinct, in that the resulting information receives only that level of analysis required for time-critical exploitation; thus, it may not yet be subjected to full analytical assessment.[16] The process phase is enhanced through the establishment of processing, exploitation and dissemination (PED) processes and capabilities that are focused on operations. As a process, PED takes data or information collected by a sensor, processes it into a useable format, subjects it to analysis, and then quickly feeds it to decision makers. As a capability, PED is the amalgamation of personnel, communications systems and architecture required to turn data into actionable information. PED organizations can either be a collection of PED nodes or an integral unit that can be tasked or requested to action specific collected data.[17]

Processing converts collected raw data into information. This may be as rudimentary as changing raw data into an intelligible form.[18] Relevant time-sensitive information should be immediately disseminated to appropriate users. Some information is suitable in its raw form to meet user requirements. For example, forward air controllers can receive a direct real-time feed from a collection source to provide an immediate perspective to enable close air support operations.[19] Additionally, the target engagement authority may gain some initial SA through a raw feed while probability-of-identification, target-location-error (TLE), collateral-damage-estimate and rules-of-engagement considerations are being assessed. The process phase

12. *ISR Primer*, 2-5.

13. AAP 1001.3, *The Air Force Approach to ISR*, 5-10.

14. Ibid., 5-11.

15. Ibid.

16. Ibid.

17. Major Alan Haywood, "PED: The Solution to Information Inundation," *InForm*, accessed November 3, 2015, http://trenton.mil.ca/lodger/cfawc/InForm/InForm_e.asp?Form=Y&ID=17 (available on the Defence Wide Area Network only).

18. *ISR Primer*, 3-7.

19. AAP 1001.3, *The Air Force Approach to ISR*, 5-12.

will evolve as an iterative function that employs the links and nodes of the networked force to share information, with the aim of enabling those handling it to add value to the information received. Information handling, therefore, becomes primarily a value-adding activity rather than an administrative function concerned mainly with information routing. In this way, processing becomes a collaborative function that uses the expertise of different organizations, seamlessly connected as part of a network, to refine and improve the quality of the ISR product as it is disseminated throughout the force.[20]

Exploit and analyse. Exploitation concerns taking advantage of information that has come to hand.[21] Analysis is the subjecting of information to review in order to identify significant facts for subsequent interpretation.[22] During these subphases, information is transformed into intelligence through a structured series of cognitive actions.[23] In near real time (NRT) ISR activity, it is likely that some or all of these actions would occur in very compressed time frames.[24] Together, these actions enable predictive battlespace awareness (PBA)[25] in support of the air campaign. To enable the level of fusion required for PBA, analysts should work in collaborative environments that provide access to recognized—and often geographically separated—subject matter experts.[26] Although developments in networking technology and automated data analysis have resulted in compressed intelligence-analysis times, the requirement for human involvement in the analytical function remains. This means that a certain degree of lag will still remain. The potential effect of this lag can be reduced by processing as a distributed, systemic function, with the processed product being made available continuously, at different levels of fidelity, throughout the network. This ability will enable commanders to bypass additional processing when the veracity of the available information is considered sufficient or if the situation requires greater expeditiousness in the decision-making process.[27]

Exploitation and analysis levels. ISR exploitation and analysis is divided into four levels (0, 1, 2 and 3). Levels 0 and 1 are directly linked to a specific mission cycle, while levels 2 and 3 are geared towards producing the larger intelligence picture.

a. **Level 0** is the NRT processing of data with minimal analysis that is concerned with identifying targets and locating high-interest or fleeting targets. It is performed by a sensor operator or a single-source PED element. It is usually disseminated to supported units or end users during a mission.

b. **Level 1** is the production of information and intelligence of immediate value that includes minimal analysis of a single collection discipline; there is some correlation and fusion with other sources. It is conducted in tactical units by organic intelligence staff and completed and disseminated before the next mission cycle.

c. **Level 2** is the specialized exploitation of collected data and information undertaken in NRT until shortly after collection. This level of exploitation and

20. Ibid., 5-13.
21. *DTB* record 4217, modified.
22. *DTB* record 3468, modified.
23. For a detailed description of these actions, see CFJP 2-0, *Intelligence*, 3-6–3-10.
24. AAP 1001.3, *The Air Force Approach to ISR*, 5-14.
25. For a full explanation of predictive battlespace awareness, see Annex B.
26. AAP 1001.3, *The Air Force Approach to ISR*, 5-16.
27. Ibid., 5-17.

analysis is conducted by dedicated PED. While it may serve immediate operational purposes, the primary emphasis is upon contributing to the larger intelligence picture.

d. **Level 3** is the detailed intelligence analysis derived from multiple sources, methods and agencies. This level of exploitation and analysis is more detailed and deliberate; it routinely fuses multiple sources of data. This exploitation and analysis is performed by higher-level organizations. The delivery of this product is not tied to the mission or operational battle rhythm.

Production. ISR products may be created in diverse formats and types, which are defined by the commander and user at the different levels of command. An ISR product can be information that has been initially processed and identified for immediate forwarding to a specific user who urgently requires it. It can also be information that is input into intelligence, operations, targeting and electronic-warfare databases, or directly into dynamic-battlespace-awareness tools such as a common operating picture.[28]

DISSEMINATION PHASE

The dissemination phase involves the delivery of information and intelligence to decision makers. Effective dissemination incorporates the factors of timeliness, easily understood products and maximizing the amount of relevant information available.[29]

Dissemination, which does not involve a processing phase, may involve sending raw data to an end user. Disseminating collected raw data and processed information throughout the network not only allows commanders to access the information they need when they need it but also facilitates more effective integration and synchronization. Nevertheless, what raw data to make directly available, and why, should be clearly established, as there is a risk that raw data may be misinterpreted or used incorrectly and could potentially bog down the ISR network. Accordingly, raw data should only be available to commanders and staffs who have the capacity and context to use the data appropriately.[30]

INTEGRATE AND EVALUATE

Throughout the phases of the ISR process, there is a continuous, central requirement for information to be integrated and evaluated. Data, information and intelligence are continuously integrated throughout the ISR enterprise. After accessing or receiving the ISR product, users evaluate the information and/or intelligence to determine whether it satisfies their requirements, and they provide feedback to ISR planners and analysts. In turn, ISR planners and analysts provide feedback to collectors about the results and effectiveness of their missions. This will allow collection managers to amend their collection plans to conduct more efficient and relevant collection operations. Additionally, enablers provide feedback on command and control, data management, connectivity and accessibility, with the aim of improving the information-sharing architecture and connectivity to meet end-user needs.

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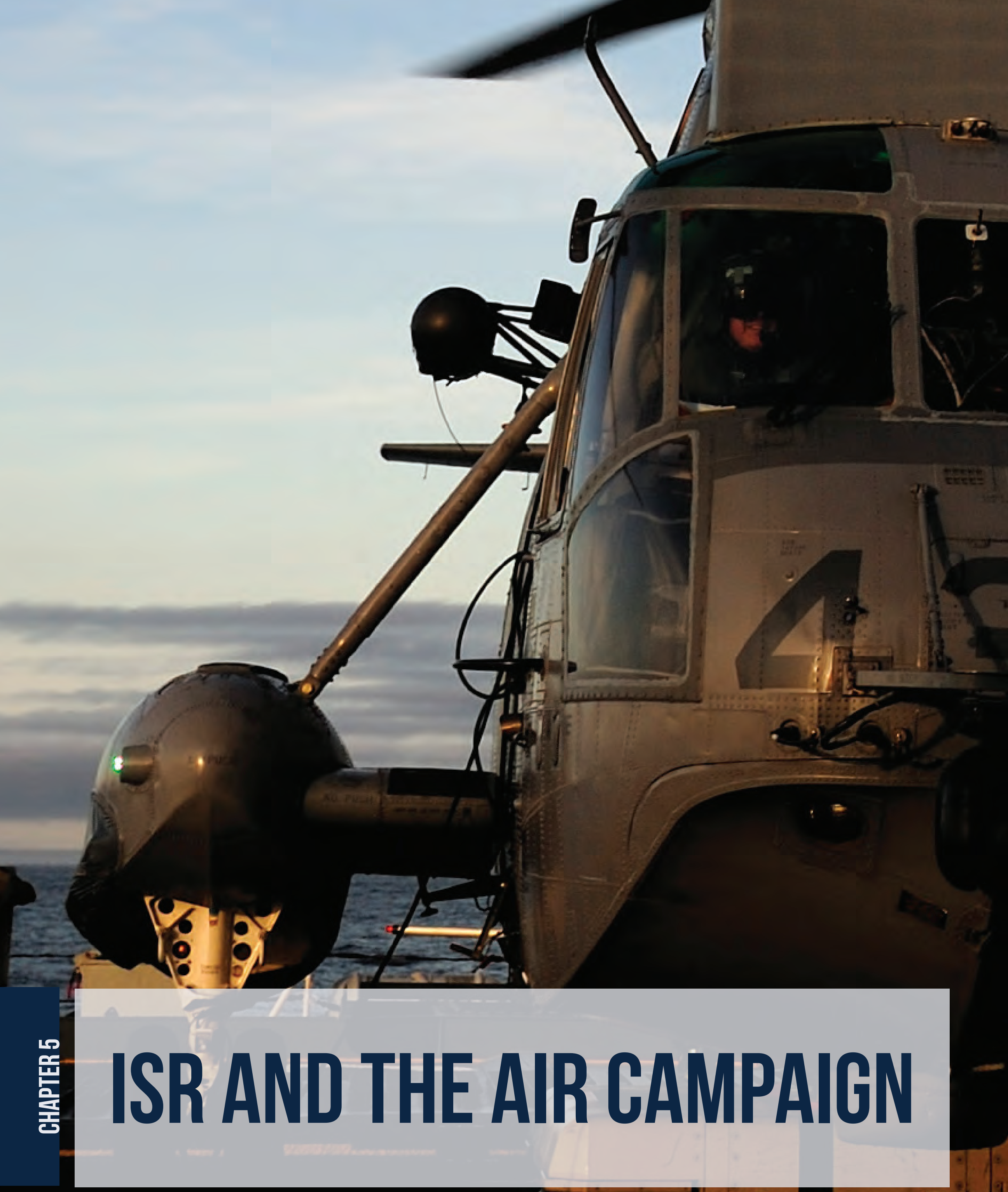
28. AAP 1001.3, *The Air Force Approach to ISR*, 5-17–5-18.
29. Ibid., 5-20.
30. Ibid., 5-20–5-23.



CHAPTER 5

ISR AND THE AIR CAMPAIGN

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The air campaign[1] is the principal means by which air operations and, thus, Royal Canadian Air Force (RCAF) intelligence, surveillance and reconnaissance (ISR) are synchronized with and contribute to the joint campaign. The ISR responsibility in the air campaign is to provide accurate, relevant and timely information and intelligence regarding an adversary's current and emerging intentions, capabilities, courses of action and centres of gravity. The ISR capability also provides ISR operations-management and target-development support. Within the air tasking cycle, ISR provides information and intelligence to inform the deliberations of all divisions of the air operations centre (AOC).[2] ISR planners must:

a. provide assessments of adversary capabilities and intentions and input them into the fused common operating picture;[3]

b. evaluate operational factors while planning and executing airborne ISR missions, including, but not limited to:

    (1) desired intelligence effect;

    (2) collection synchronization;

    (3) cross-cueing;

    (4) periodicity (revisit time);

    (5) duration; and

    (6) location;

c. liaise with communications staff to synchronize communications requirements with collection as well as processing, exploitation and dissemination (PED) requirements;[4]

d. liaise and coordinate with other Canadian Armed Forces entities, government agencies and allies to source information requirements (IR), which could also include sourcing processing capacity;[5] and

e. provide direct target-development support.[6]

ISR PARTICIPANTS IN AN AIR CAMPAIGN

Joint force commander (JFC). The JFC must formulate a vision for conducting the joint campaign that blends the maritime, land, air and special-operations aspects

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1. *Defence Terminology Bank* (*DTB*) record 18743, modified, defines the term "campaign" as "a set of operations planned and conducted to achieve a strategic objective within a given time and geographical area."

2. AAP 1001.3, *The Air Force Approach to ISR*, 4-1–4-2.

3. Ibid., 4-2.

4. Ibid.

5. Ibid.

6. Ibid.


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into a single overarching joint-force concept.[7] It is the IR of the JFC that essentially drive the ISR efforts of all the components.

Air component commander (ACC). The "ACC is the designated commander responsible for making recommendations to the joint commander on the proper employment of all assigned, attached and made-available [air] forces."[8] The responsibilities of the ACC will normally include planning, coordinating, allocating and tasking assigned airborne ISR assets in order to accomplish and fulfil the JFC's tasks and requirements. If the ACC does not have the available assets or capabilities available to satisfy these requirements, the ISR division within the combined air operations centre will identify unfulfilled IR and forward them to higher headquarters for resolution.[9]

Air component headquarters (ACHQ). An ACHQ is the operational-level element that supports an ACC.[10] The ACHQ consists of an air staff and an AOC.[11]

Air staff. The air staff performs planning, coordinating and administrative functions on behalf of the ACC, including coordinating ISR operations and missions. Key staff in the ACHQ involved in ISR include:[12]

a. **A2 – Intelligence staff.** The A2 informs air commanders of the integrated intelligence roles within ISR. The A2 represents the ACC's requirements at joint intelligence-planning forums and works with other air-staff planners to ensure that the intelligence-support-plan annexes to operations orders represent realistic, integrated and effective intelligence architecture. The A2 also has responsibility for air-specific intelligence requirements and shares oversight of collection management with the chief of the intelligence, surveillance and

7. Canada, Department of National Defence (DND), B-GJ-005-300/FP-001, CFJP 3.0, *Operations* (Ottawa: Department of National Defence, 2011), 5-1.

8. Canada, DND, B-GA-401-000/FP-001, *Canadian Forces Aerospace Command Doctrine* (2012), 26.

9. AAP 1001.3, *The Air Force Approach to ISR*, 4-4.

10. B-GA-401-000/FP-001, *Canadian Forces Aerospace Command Doctrine*, 23.

11. AAP 1001.3, *The Air Force Approach to ISR*, 4-5.

12. Ibid.

reconnaissance division (ISRD) in the AOC.[13]

b. **A3/A5 – Operations/plans staff.** The A3 and A5 undertake deliberate and immediate planning of all RCAF operations and exercises. The A3 and A5 represent the air commander's requirements at joint planning forums.[14]

c. **A6 – Communications staff.** The A6 plans and designs the network infrastructure that transmits ISR data, information and intelligence throughout the battlespace. Communications security, bandwidth and radio-frequency spectrum management are vital to the effectiveness of the ISR system.[15]

Air operations centre. The AOC is the principal point from which air operations are planned and executed. As encapsulated in Figure 5-1, the AOC plans, tasks and executes the theatre airborne ISR mission. Subtasks of this responsibility include:

a. identifying and managing the ACC's ISR requirements;

b. managing the joint commander's ISR requirements in conjunction with other components and with validation from the joint commander;

c. integrating and synchronizing the use of air and space ISR capabilities; and

d. tasking airborne ISR assets to satisfy the joint commander's requirements.[16]

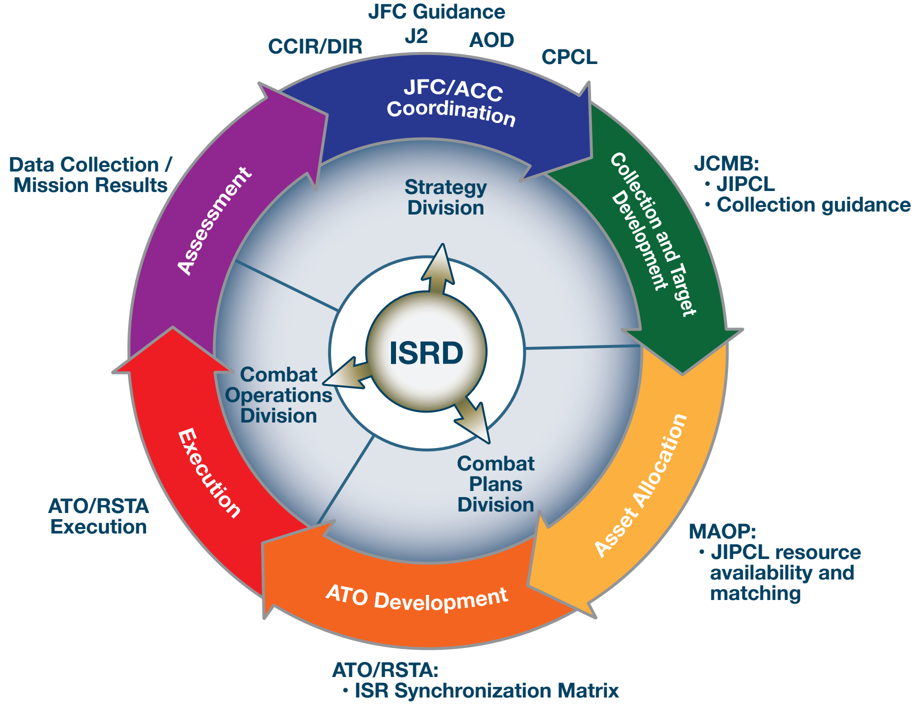


Figure 5-1. AOC ISR processes and deliverables during the air tasking cycle

13. Ibid., 4-5–4-6.
14. Ibid., 4-6.
15. Ibid.
16. Ibid.

Within the AOC, the division have the following ISR-related tasks:

a. **Intelligence, surveillance and reconnaissance division.** The ISRD's primary mission is to maintain predictive battlespace awareness in order to provide holistic intelligence, ISR and targeting input throughout the AOC and subordinate elements. The ISRD is also responsible for synchronizing of the ISR collection, processing and dissemination capabilities allocated to the ACC and has primary responsibility for development of the air component prioritized collection list (CPCL). This list is the result of collection requirements management (CRM), which constitutes reviewing, validating, prioritizing, coordinating, submitting and assessing information requirements. The ISRD is also the air components' collection operations manager, which directs, schedules and controls specific ISR collection operations.[17] The result of this process is the air tasking order (ATO) ISR annex,[18] known as the reconnaissance, surveillance and target acquisition (RSTA) annex.[19]

b. **Strategy division (SD).** The SD develops, refines, disseminates and assesses the ACC's operations strategy for all phases of a campaign. The SD concentrates on long-range planning of air operations and assessing a campaign's progress; it also provides short-term guidance based on the progress of the air operations or air campaign plans. The SD initiates the ATO cycle with daily guidance in the air operations directive (AOD).[20]

c. **Combat Plans Division (CPD).** The CPD develops detailed execution plans for air operations. Based on planning inputs from the SD and forces available, the CPD produces the Master Air Operations Plan (MAOP), which in turn drives the creation of the ATO, airspace control order (ACO) and other near-term planning and tasking documents.[21]

d. **Combat Operations Division (COD).** The COD is responsible for the current day's air effort and works closely with the CPD and ISRD to effectively direct the execution of the ATO. Additionally, missions may be retasked by the COD to meet time-critical requirements; for ISR missions, this activity is called dynamic collection operations management and falls under the responsibility of the senior intelligence duty officer (SIDO). ISR personnel in the COD also provide current situational awareness, time-sensitive targeting and ISR battle management for execution of the ATO.[22]

PLANNING AND EXECUTING AIR ISR IN A JOINT ENVIRONMENT

The following describes the processes, authorities and responsibilities involved in conceiving, defining, executing and assessing an air ISR task. This is a generic

17. *ISR Primer*, 5-3.

18. AAP 1001.3, *The Air Force Approach to ISR*, 4-7.

19. For an example of a reconnaissance, surveillance and target acquisition annex, see Annex C.

20. United States Air Force, Air Force Instruction 13-1 AOC Volume 3 (AFI13-1AOCV3), *Operational Procedures – Air and Space Operations Centre* (*AOC*) (2 November 2011), 22–23.

21. Ibid., 29.

22. AAP 1001.3, *The Air Force Approach to ISR*, 4-8.

AOC-based process that supports a joint force engaged in operations that require both ISR and targeting activities. Though tailorable to meet specific situations, these processes are designed to meet the ISR truism that information and collection requirements will outnumber the assets available to fulfil them.[23]

The air operational planning cycle commences with the commander's guidance. The joint-level ISR planning process, as depicted in Figure 5-2, begins with guidance developed by the joint force J2, who is the collection management authority (CMA). The CMA determines the priority, focus and weight of ISR efforts, provides sensor-tasking guidance, and also develops the joint-level collection plans in the joint commander's area of responsibility (AOR).[24] The CMA would also provide direction for the joint collection management board (JCMB).

The JCMB meets regularly—the frequency depending on the current operational tempo—to synchronize and prioritize ISR requirements across the joint AOR. The JCMB is chaired by the J2 and includes representatives from the intelligence disciplines, components and the J3. Each representative nominates and prioritizes their collection requirements (CRs) into a CPCL.[25] The JCMB reviews these lists, validates requirements and prioritizes them into the joint integrated prioritized collection list (JIPCL). The JCMB also assigns priorities for allocating of platforms and sensors and deconflicts competing requirements where necessary. The JCMB articulates collection management guidance to the components and other subordinate formations,[26] including identifying and pre-validating high-priority, time-sensitive requirements for dynamic retasking of ISR forces.

The air input into this process comes from the AOC SD, which produces the AOD. The AOD outlines the ACC's apportionment, objectives and ISR strategy as well as CRs. The ISR input into the AOD is produced by the ISRD, which has CRM authority for the air component. This input consists of priority intelligence requirements, ISR strategy-to-task statements, capability and availability of ISR assets as well as ISR processing objectives.[27]

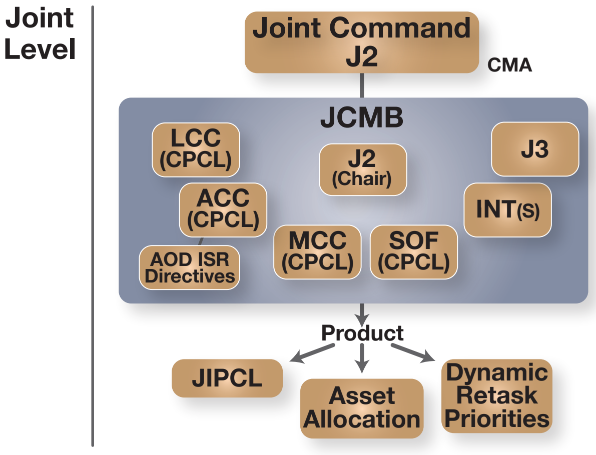


Figure 5-2. The joint-level ISR planning process

23. *ISR Primer*, 5-1.

24. United States Air Force, Air Force Doctrine Document 2-9 (AFDD 2-9), *Intelligence, Surveillance, and Reconnaissance Operations* (17 July 2007), 45.

25. Air Force Tactics, Techniques and Procedures (AFTTP) 3-3.AOC, *Operational Employment – Air Operations Centre*, 3-1.

26. *ISR Primer*, 5-4.

27. AFTTP 3-3 AOC, *Operational Employment – Air Operations Centre*, 3-4.

After the JCMB meets, the ISR allocation requirements for the air component are passed to the AOC. As seen in Figure 5-3, referencing this allocation, the AOC CPD consolidates collection and targeting planning in the MAOP.[28] From the guidance in the MAOP, ACC systems and components are assigned to collection targets based on the desired intelligence effect and the sensors required. Sensor requirements are then evaluated, grouped and assigned to platforms, with the aim of optimizing coverage and efficiency.

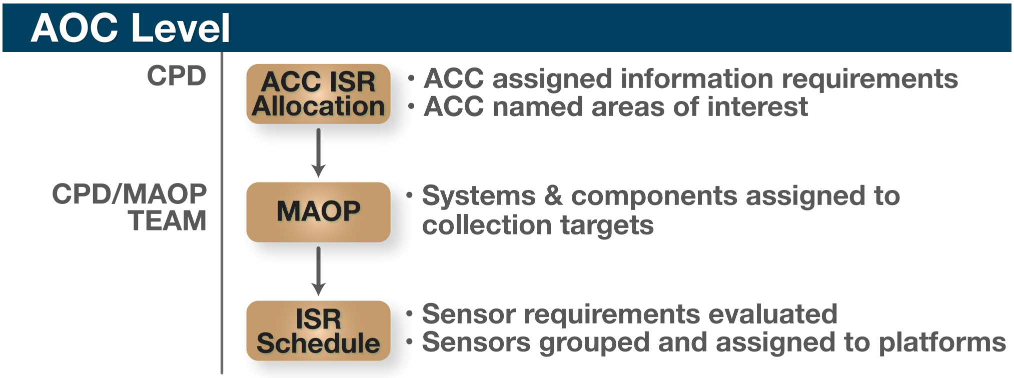


Figure 5-3. ISR air component planning

After the MAOP is approved, as detailed in Figure 5-4, the ATO production team merges the plan with special instructions (SPINS) as well as communications and airspace-control inputs to produce the ATO and ACO. After the merged data is validated and approved, the ATO is released. An ISR annex (RSTA) is published as part of the ATO. It contains detailed tasking of ISR platforms and sensors as well as specific guidance for collectors. It also contains information for PED nodes, ISR managers (such as pre- and post-strike reporting timelines and formats to be used) as well as imminent-threat warning support processes and procedures.[29] One of the tools in the RSTA is the ISR synchronization matrix (see Annex D), which is a graphic representation of the ISR schedule integrated with combat operations.[30]

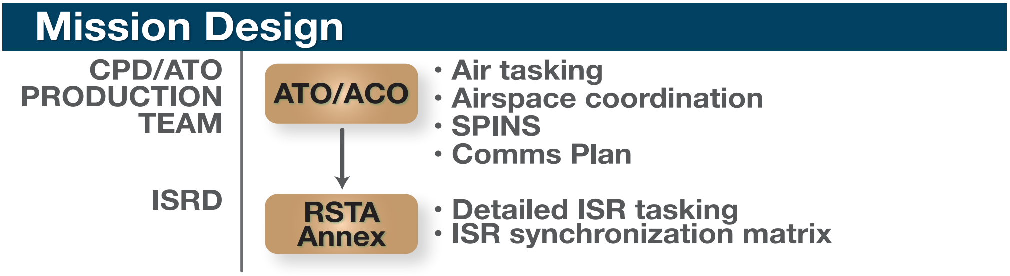


Figure 5-4. ISR mission design

28. Ibid., 1-10.
29. AAP 1001.3, *The Air Force Approach to ISR*, 4-10.
30. AFTTP 3-3 AOC, *Operational Employment – Air Operations Centre*, 4-4.

In Figure 5-5, during execution, the COD, headed by the chief of combat operations, directs operations for the joint force air component commander (JFACC). The COD monitors execution, publishes ATO changes and directs, as necessary, real-time changes to the published ATO. Additionally, the SIDO ensures the RSTA annex is monitored and adjusted as necessary.[31]

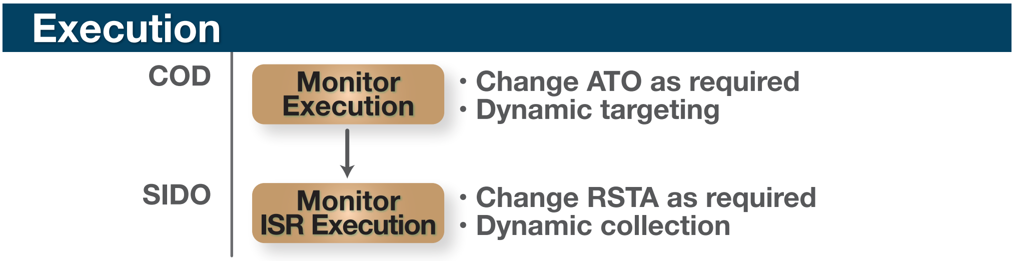


Figure 5-5. ISR mission execution

As the ATO is being executed, operational assessments are conducted. In Figure 5-6, this includes battle damage assessment (BDA), weapons-effect assessment, re-attack assessment and mission assessment. Additionally, the SD assesses the effectiveness of the executed ATO in relation to the stated objectives. For ISR, this includes assessing the results of collection and refining the ISR strategy. Collection assessment involves various factors such as mission effectiveness (e.g., on-station time or target-deck satisfaction). Another factor is intelligence priority, which may be linked to AOD objectives, operational tasks as well as priority or information requests. Finally, the intelligence value of the information collected is assessed. With JFACC approval, recommended changes in command guidance are provided to the JFC for consideration or implementation and the collection-management process recommences.[32]

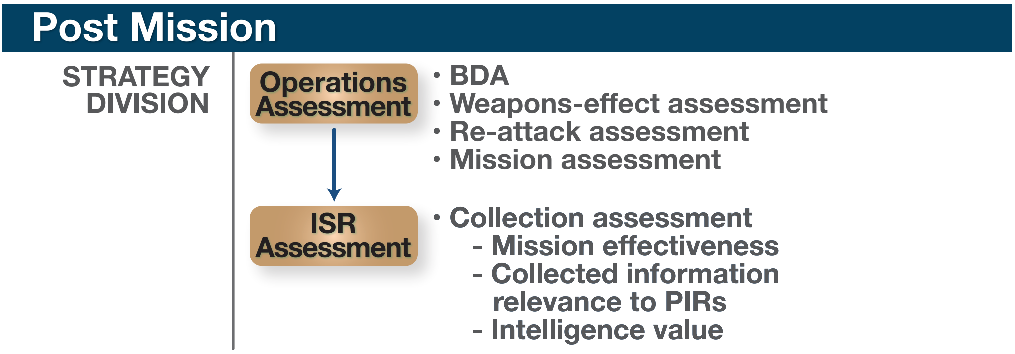


Figure 5-6. ISR mission assessment

31. AAP 1001.3, *The Air Force Approach to ISR*, 4-10.
32. Ibid., 4-10–4-11.

CHAPTER 6

ISR EMPLOYMENT AND MISSIONS

CAF Photo

Airborne intelligence, surveillance and reconnaissance (ISR) collection platforms can provide wide-area or point surveillance and employ capabilities that include radar surveillance and imagery, electro-optical (EO) and thermal imagery (TI), full motion video (FMV), underwater acoustics, weapon-locating information and electronic surveillance measures (ESM).[1] See Annex A for a list of sensor types used by the Royal Canadian Air Force (RCAF).

NON-CRISIS AND PEACETIME

Typical RCAF ISR activities in peacetime consist of supporting Canada's sovereignty by monitoring the approaches to Canada. This entails ground-based systems such as radars and electronic intelligence (ELINT) detectors in conjunction with air-based systems. Space-based and other forms of intelligence cuing direct air-based sensors to collect detailed information on any targets of interest.

Missions involved in these activities include:

a. monitoring and identifying vessels of interests in Canadian waters;

b. monitoring fishing activity within or near Canadian waters;

c. monitoring foreign economic activity within or near Canadian waters; and

d. surveying Canadian sovereign territory and approaches for illegal or suspicious activity.

CAF Photo

1. *ISR Primer*, 1-8.

PRE-CONFLICT

During a crisis-prevention phase, strategic ISR assets, such as space-based or national collection agencies, service the bulk of the information requests. Airborne ISR assets employ ESM and long-range imaging sensors to help build situational awareness by collecting data for orders of battle, indications and warning as well as target intelligence. Airborne ISR platforms also provide an element of deterrence, as the presence of such assets may suppress the activities of a potential opponent.[2]

CONFLICT

During a conflict, the ISR enterprise provides near real time and archived ISR products and information (at operational and tactical levels) to enhance the development of intelligence and, hence, inform the decision-making process. Those directly involved in engaging targets require target-acquisition information in sufficient detail to allow the effective cueing of high-resolution ISR assets, the employment of weapons as well as subsequent battle damage and combat assessments. "The information provided [by the ISR enterprise typically would] include the physical location and the activity, size and status of forces and other targets."[3] Such information is used "to cue other ISR assets, to support target identification and to improve understanding of the nature of static or stationary targets."[4]

POST-CONFLICT

"During conflict resolution, commanders require information on the opponent's intentions along with the redeployment activity and status of [their] forces."[5] ISR assets are used to monitor lines of communication, assembly areas and airfields where periodic synthetic aperture radar imaging reduces the burden on inspection forces. Ground moving target indicator (GMTI) radar surveillance can monitor movement while EO systems locate and identify the types of vehicles on the move. Information derived from the EO system may also be used to indicate humanitarian and environmental problems by monitoring general traffic flow. The EO system can then be augmented by periodic GMTI radar and EO/TI surveillance of populated areas should unusual traffic movement be detected.[6]

CRISIS RESPONSE OPERATIONS

"Crisis response operations range from support operations, primarily associated with civil agencies, through operations in support of peace, to combat operations."[7] ISR forces additionally conduct extraction operations and tasks in support of disaster relief and humanitarian operations, search and rescue operations and support to

2. Ibid.
3. Ibid., 1-9.
4. Ibid.
5. Ibid.
6. Ibid.
7. Ibid.

CAF Photo

non-combatant evacuation operations. ISR forces engage in a variety of missions and use the full range of sensor suites. For instance, ESM is used to track and monitor terrorist or insurgent activity and monitor compliance with ceasefire and separation agreements. GMTI helps monitor refugee and illegal-migration movements in remote areas and provides cuing to EO and ground-based surveillance for close-in verification. During evacuations and search and rescue operations, various sensors provide cuing regarding personnel locations or possible threats to evacuees and rescuers.[8]

Irregular warfare. Since the Korean War, the RCAF has conducted combat missions involving irregular forces far more than any other form of conflict, and this trend will likely continue in the decades to come. This type of warfare presents significant challenges to ISR forces, as some or all of the belligerents may not be members of regular or paramilitary forces and, thus, are hard to identify or differentiate from the local populace. Additionally, irregular forces often have a fleeting or part-time presence in the operational environment. These characteristics require unique and flexible approaches to ISR employment.

The focus of ISR in irregular warfare is on individuals and networks rather than the conventional warfare focus: military forces. ISR planning and employment will be less rigid than the joint integrated prioritized collection list–driven conventional model and must be more dynamic and responsive to the momentary requirements of tactical units. ISR forces will need to employ systems with a long-dwell presence that can provide an unblinking eye to help build a comprehensive analysis of the pattern of life and enable the use of change-detection tools.

8. Ibid., 1-10.

ANNEX A – SENSOR TYPES

GROUND MOVING TARGET INDICATOR RADAR

"Ground moving target indicator (GMTI) radar provides … detection, location and tracking of moving vehicles and relatively slow-moving, low-flying aircraft and helicopters. Wide-area coverage is conducted at moderate refresh rates, whilst higher rates can be achieved over smaller areas to facilitate detailed tracking, particularly for targeting. GMTI radar is capable of supporting … [indications and warning] and attack operations. It can also reveal the movement of groups (such as refugees) using motor vehicles, their rate of movement and gathering points."[1]

SYNTHETIC APERTURE RADAR

"[Synthetic aperture radar] imaging techniques generate a 'photograph-like' surface image, which will include static or stationary objects. However, discrete moving objects (such as individual vehicles) might not be detectable by all current airborne systems. Large areas can be covered at moderate resolution ('swath' mode) with higher resolution, in some cases sufficient for recognition of targets, achieved over small areas ('spot' mode)."[2]

ELECTRO-OPTICAL

"[Electro-optical] EO imaging systems operate in the visual range of the electromagnetic (EM) spectrum and capture still images and video. The resolution of the sensor system is dependent on a number of factors (such as distance, amount of available light, optical resolution of the lens, resolution of the photosensitive electronic sensor, etc.) and will determine whether an imagery analyst can identify and recognize objects and activities under investigation."[3] EO images are essentially photo/video views which are easily interpreted. EO has the disadvantage of being dependent on light and weather conditions.

INFRARED IMAGING

"Infrared [IR] … imaging detects infrared energy being emitted from an object with or without visible illumination. The higher the temperature of the object, the greater the infrared radiation emitted; therefore, warm objects stand out well against cooler backgrounds and become easily visible against the environment, day or night. An infrared sensor converts 'invisible' infrared energy into a two-dimensional visual image that shows hot and cold areas. However, in order to identify objects of interest, the objects must possess a temperature differential to its environment, otherwise the collected image does not provide the thermal imagery analyst enough image contrast to detect, identify and recognize the objects under observation."[4] This limits the effectiveness of IR imaging during atmospheric thermal crossover and atmospheric attenuation.

1. *ISR Primer*, 2-6.
2. Ibid.
3. Ibid.
4. Ibid.

MULTI-SPECTRAL IMAGING

"In multi-spectral imaging (MSI), images of a scene or object illuminated by the sun or other sources are created using reflected or emitted energy from different parts of the spectrum."[5] An MSI image is a collection of several images of an object taken by a sensor that captures different and specific wavelength bands. These separate images are then combined to form a multi-spectral image. MSI is useful for detecting specific materials in or around a target, as each material emits a specific wavelength in the EM spectrum. MSI is affected by weather and the amount of daylight available.

HYPER-SPECTRAL IMAGING

Hyper-spectral imaging is similar to MSI but collects narrow and significantly more wavelength bands with much finer spectral resolution. The resulting data offers a more detailed view of the spectral properties of a scene. A primary goal of spectral-imagery collection is to discriminate, classify, identify and quantify materials present in the image. Some common collection targets from recent operations are home-made explosives or fuel residues used in the production of improvised explosive devices.

SIGINT SENSOR

A signals intelligence (SIGINT) sensor gathers signals from either communications between people (communications intelligence [COMINT]) or from electronic signals not directly used in communication (electronic intelligence [ELINT]) such as radar emissions. SIGINT sensors often have the dual purpose of gathering the data in the signal and providing indicators of the location of the emitting source.

ACOUSTIC SENSOR

An acoustic sensor detects sound waves moving through a certain material, such as air or water, and converts these waves into a digital signal output. Antisubmarine warfare aircraft use sonobuoys or dipping sonar to detect acoustic signals and relay them to a processor on the aircraft. Acoustic sensors can either be active (emitting and receiving a signal) or passive (receiving only).

MAGNETIC ANOMALY DETECTORS

The sensors on a magnetic anomaly detector identify the natural and manmade differences in the earth's magnetic fields. Some of these changes can be caused by the passing of large ferrous objects (e.g., ships, submarines and aircraft) through the earth's magnetic field.

5. United States Air Force, *Incident Awareness and Assessment (IAA) Handbook* (Tyndall Air Force Base, June 2010), 10, accessed November 3, 2015, https://www.hsdl.org/?view&did=9371.

ANNEX B – PREDICTIVE BATTLESPACE AWARENESS

Predictive battlespace awareness (PBA)[1] is a multidimensional understanding of the operational environment in time, space and effect to predict adversary intent and/or potential future enemy courses of action (COAs). PBA is achieved when the commander possesses relevant, comprehensive knowledge. PBA is a predictive and proactive methodology that stresses action vice reaction.[2]

PBA requires the development and synchronization of five key elements to achieve this level of awareness:

a. **Joint intelligence preparation of the operational environment (JIPOE)** is a systematic and continuous four-step analytical process by which adversary capabilities, vulnerabilities and probable COAs in a specific operations environment are determined.[3] The four steps of JIPOE are:[4]

   (1) define the battlespace environment;

   (2) describe the battlespace effects;

   (3) evaluate the adversary; and

   (4) determine adversary COAs.

b. **Target development.** Targeting links strategy to the tactical application of both lethal and non-lethal air power. Target development determines the criticality, vulnerability and suitability of each target as well as relationships between and within target systems to create the desired effects that achieve the commander's objectives.[5]

c. **Intelligence, surveillance and reconnaissance (ISR) strategy and planning** consists of four main tasks:

   (1) understanding joint commander and joint force air component commander guidance;

   (2) understanding ISR asset capabilities and availability;

   (3) integrating ISR capabilities with operations; and

   (4) synchronizing collection to requirements.

1. See also AFDD 2-9, *Intelligence, Surveillance, and Reconnaissance Operations*, 2-9, 2-10.
2. AAP 1001.3, *The Air Force Approach to ISR*, 4-11.
3. CFJP 2-0, *Intelligence*, 3-2.
4. AAP 1001.3, *The Air Force Approach to ISR*, 4-1–4-12.
5. Ibid., 4-12.

d. **ISR employment** ensures the integration of platforms and their sensors through the ISR collection plan to anticipate, confirm, monitor and analyse adversary activity. At the same time, ISR employment must enable targeting, dynamic manoeuvre, force insertion, force protection and combat assessment while confirming previous predictions and providing the raw data for the continuous update of the predictive process.[6]

e. **Assessment.** During assessment, the progress towards objectives is measured and recommendations for the course of future operations are made.[7]

If these five elements are continuously refined, in parallel, to provide a comprehensive view of the operational environment, they should provide commanders with appropriate understanding to anticipate future conditions, assess changing conditions, establish priorities and exploit emerging opportunities, all while mitigating the effect of unexpected adversary actions.[8]

6. Ibid.
7. Ibid., 4-13.
8. Ibid., 4-14.

ANNEX C – SAMPLE RSTA ANNEX FORMAT[1]

ISR highlights: (major operations requiring ISR support, focus and emphasis). Key impacts of success/failure should be noted.

ISR planning guidance:
    JFC guidance and objectives
        JFC PIRs
        ISR priorities finalized in the JCMB
        Collection management authority (CRM/COM and SOTA delegation)
        Additional JFACC guidance as appropriate

Significant component operations/priorities:
    JFACC
    JFLCC
    JFMCC
    JSOTF

Ad hoc collection guidance:
    Dynamic ISR retasking priorities
        JFC TST support
        Other
    Ad hoc procedures
        Ad hoc form

ISR communications plan (may duplicate some information in the SPINS communications plan)
    Collaboration architectures (e.g., IWS, MIRC)
    RSTA annex distribution plan
    Websites
    Servers / chat rooms

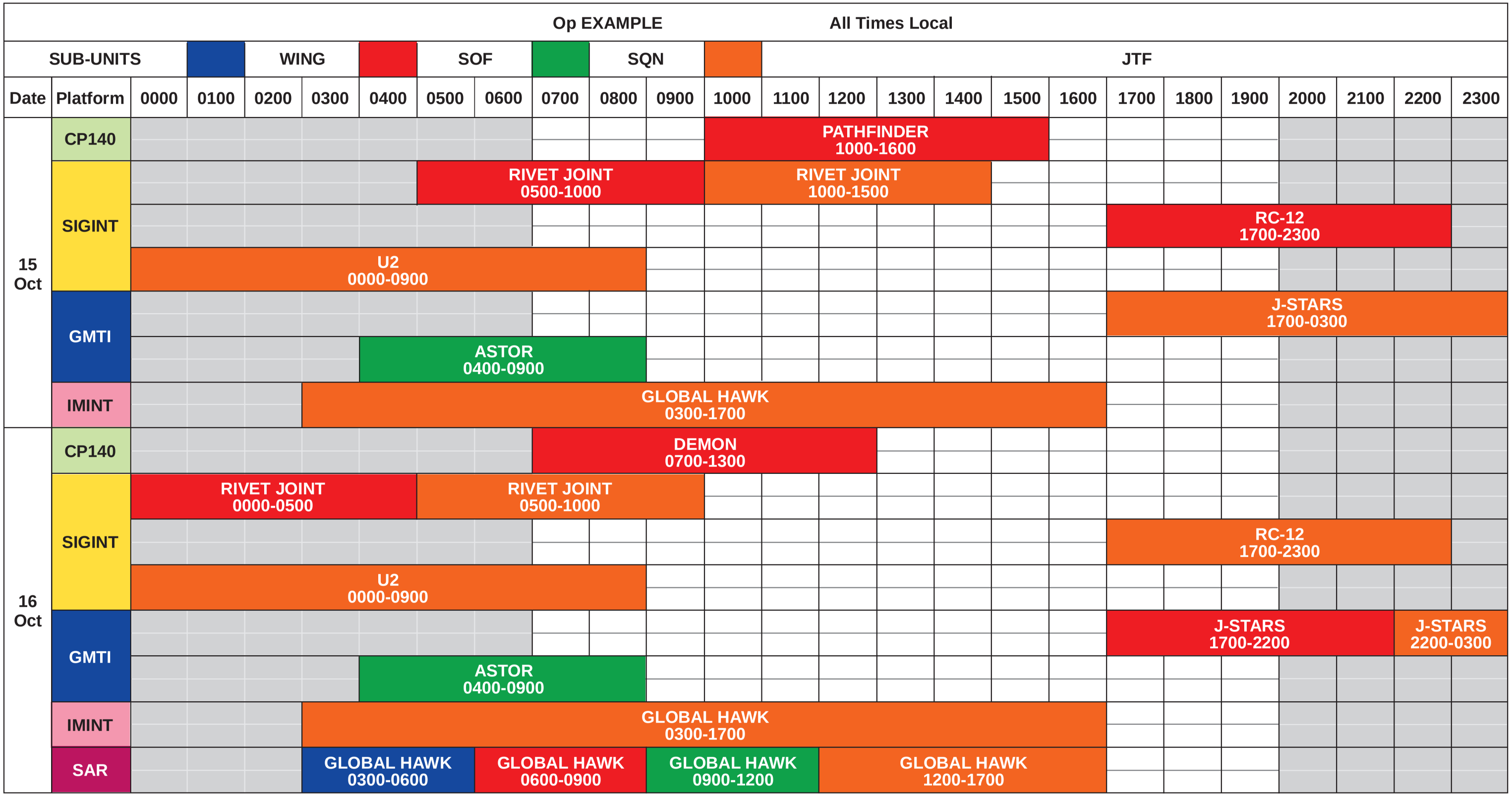
PED management:
    PED guidance
    PED tasking
    PED dissemination plan
    PED architecture

ISR plan:
    ISR synchronization matrix
    Individual mission emphasis
    Cross-cueing guidance
    Orbit/track plan
    Tasking (by INT and platform)
        IMINT
        FMV
        SIGINT
        MASINT
        NTISR

Non-JFACC ISR (e.g., SA from other components, national requirements, etc.)

1. AFTTP 3-3 AOC, *Operational Employment –Air Operations Centre*, 6-105.

ANNEX D – ISR SYNCHRONIZATION MATRIX EXAMPLE



Note: The ISR synchronization matrix is a time-based representation of the friendly ISR battlefield capabilities throughout the conduct of an operation.

GLOSSARY

The definitions contained in this glossary are derived from a number of sources. Where this publication is the source of a definition, no source is indicated. Definitions taken from other sources are indicated in parentheses at the end of each term, utilizing the following abbreviations:

a. AAP 1001.3 – Australian Air Publication 1001.3, *The Air Force Approach to ISR*;

b. AFDD 2-9 – United States Air Force, Air Force Doctrine Document 2-9, *Intelligence, Surveillance, and Reconnaissance Operations*;

c. AFTTP 3-3.AOC – United States Air Force, Air Force Tactics, Techniques and Procedures 3-3.AOC, *Operational Employment – Air Operations Centre*;

d. CFJP 2.0 – B-GJ-005-200/FP-001, Canadian Forces Joint Publication (CFJP) 2-0, *Intelligence*;

e. *DTB* – *Defence Terminology Bank*, http://terminology.mil.ca/term-eng.asp;

f. JP 2-0 – United States Joint Chiefs of Staff, *Joint Publication 2-0 (JP 2-0), Joint Intelligence*; and

g. *ISR Primer*– Royal Air Force, *Intelligence, Surveillance and Reconnaissance Primer*.

air platform
An aircraft through which air power creates effects. (*DTB* record 34077)

air tasking cycle
The connecting links of people, processes and products that transitions air power planning from the operational to the tactical level.

analysis
A step in the processing phase of the intelligence cycle in which information is subjected to review in order to identify relevant facts for subsequent interpretation. (*DTB* record 44093)

analysis node
A node that analyses and exploits intelligence, surveillance and reconnaissance data and information and produces intelligence as part of the intelligence cycle. (AAP 1001.3 modified)

basic intelligence
Intelligence that provides reference material for planning and as a basis for processing subsequent information. (*DTB* record 3622)

collection management authority (CMA)
The individual with the authority to determine the priority, focus and weight of intelligence, surveillance and reconnaissance efforts by validating collection requirements, establishing sensor tasking guidance and developing collection plans. (AFDD 2-9 modified)

collection operations management (COM)
The direction, scheduling and control of specific collection operations as well as the associated processing, exploitation and reporting resources. (AFDD 2-9 modified)

collection requirements management (CRM)
In intelligence, surveillance and reconnaissance operations, the development and control of collection, processing, exploitation and reporting requirements. (AFDD 2-9)

commander's critical information requirements (CCIR)
Crucial information identified and required by the commander that directly affects decision making and the successful execution of operations. (*DTB* record 41494)

common operating picture (COP)
An interactive and shared visual representation of operational information gathered from various sources. (*DTB* record 41401)

current intelligence
Time-critical, perishable intelligence, about the current situation and events, that has undergone limited analysis. (*DTB* record 3980)

cyber environment
The interdependent networks of information technology structures, including the Internet, telecommunications networks, computer systems, embedded processors and controllers as well as the software and data that reside within them.

decision superiority
The ability of commanders, based upon information superiority and situational awareness, to make effective decisions more rapidly than their adversary, thereby gaining an advantage in the tempo, coherence and effectiveness of operations. (*DTB* record 41405)

dissemination
The timely conveyance of information, in an appropriate form and by any suitable means, to those who need it. (*DTB* record 4100 modified)

essential elements of information (EEI)
The most critical commander's information requirements regarding the adversary and the environment. (JP 2-0)

estimative intelligence
Intelligence that provides a forward-looking assessment and predictive judgment about future foreign developments, potential courses of action and their implications. (*DTB* record 43614)

exploitation
Taking full advantage of any information that has come to hand for tactical or strategic purposes. (*DTB* record 4217)

fusion node

An intelligence organization that synergistically blends information from multiple sources to enhance situational awareness. (AAP 1001.3)

geospatial intelligence (GEOINT)

Intelligence derived from the combination of geospatial information, including imagery, with other intelligence data to describe, assess and visually depict geographically referenced activities and features on earth. (*DTB* record 27911)

human intelligence (HUMINT)

A category of intelligence derived from information collected and provided by human sources. (*DTB* record 700)

information assurance

Measures that protect and defend information and information systems by ensuring their availability, integrity, authentication, confidentiality and non-repudiation.

information requirements (IR)

In intelligence usage, information regarding an adversary or potentially hostile actors and other relevant aspects of the operating environment that needs to be collected and processed to meet the intelligence requirements of a commander. (*DTB* record 43334)

intelligence (int)

The product resulting from the collection, processing, analysis, integration and interpretation of available information concerning foreign states, hostile or potentially hostile forces or elements, geography and social and cultural factors that contributes to the understanding of an actual or potential operating environment.

Note: The term "intelligence" also applies to the activities that result in the product and to the organizations engaged in such activities. (*DTB* record 738)

intelligence, surveillance and reconnaissance (ISR)

An activity that synchronizes and integrates the planning and operation of all collection capabilities with exploitation and processing to disseminate the resulting information to the right person, at the right time, in the right format, in direct support of current and future operations. (*DTB* record 30996)

master air operations plan (MAOP)

The air component commander's time-phased air and space scheme of manoeuvre for a given air tasking order period that synthesizes guidance, desired effects, supported component's scheme of manoeuvre, available resources as well as friendly and enemy capabilities. (AFTTP 3-3.AOC)

measurement and signature intelligence (MASINT)

Intelligence derived from the scientific and technical analysis of data obtained from sensing instruments for the purpose of identifying any distinctive features associated with the source, emitter or sender, to facilitate the latter's measurement and identification. (*DTB* record 4749)

operational environment (OE)
The set of conditions, circumstances and influences that affect the employment of capabilities and bear on the decisions of the commander. (*DTB* record 43606)

predictive battlespace awareness (PBA)
A multidimensional understanding of the operational environment in time, space and effect to predict adversary intent and/or potential future enemy courses of action. (AFDD 2-9)

priority intelligence requirements (PIR)
Those intelligence requirements for which a commander has an anticipated and stated priority in [the commander's] task of planning and decision making. (*DTB* record 1105 modified)

processing
The stage of the intelligence cycle during which collected information is sorted and converted into a form suitable for the production of intelligence. Note: Processing comprises collation, evaluation, analysis, integration and interpretation. (*DTB* record 5786)

reporting time
The lapsed time between a source collecting an item of data and its reception, in the desired format, by a user. (*ISR Primer*)

response time
The time between the initiation of an information request and the receipt of an answer. (*ISR Primer*)

sensor
Any equipment which detects, and may indicate, and/or record objects and activities by means of energy or particles emitted, reflected or modified by objects. (*DTB* record 5344 modified)

signals intelligence (SIGINT)
Individual or multi-sensor intelligence derived from communications intelligence, electronic intelligence and foreign instrumentation signals intelligence. (CFJP 2-0)

situational awareness (SA)
The knowledge of the elements of the operational environment necessary to make well-informed decisions. (*DTB* record 41441)

ABBREVIATIONS

AAP	Australian Air Publication
ACC	air component commander
ACHQ	air component headquarters
ACO	airspace control order
AFTTP	Air Force Tactics, Techniques and Procedures
AOC	air operations centre
AOD	air operations directive
AOR	area of responsibility
ATO	air tasking order
BDA	battle damage assessment
C2	command and control
C Air Force	Chief of the Air Force Staff
CCIR	commander's critical information requirements
Cdn Air Div	Canadian Air Division
CFJP	Canadian Forces Joint Publication
CMA	collection management authority
COA	course of action
COD	Combat Operations Division
COM	collection operations management
COMMS	communications
CPCL	component prioritized collection list
CPD	Combat Plans Division
CR	collection requirement
CRM	collection requirements management
DIR	defence intelligence requirements
DND	Department of National Defence
DTB	Defence Terminology Bank
ELINT	electronic intelligence
EM	electromagnetic
EO	electro-optical

ESM	electronic surveillance measures
FMV	full motion video
GEOINT	geospatial intelligence
GMTI	ground moving target indicator
ICT	information and communication technology
IMINT	imagery intelligence
int	intelligence
IR	information requirement
IR	infrared
ISR	intelligence, surveillance and reconnaissance
ISRD	intelligence, surveillance and reconnaissance division
IWS	individual weapon sight
JCMB	joint collection management board
JFACC	joint force air component commander
JFC	joint force commander
JFLCC	joint forces land component command
JFMCC	joint forces maritime component command
JIPCL	joint integrated prioritized collection list
JIPOE	joint intelligence preparation of the operational environment
JSOTF	joint special operations task force
JTF	joint task force
LCC	land component command
MAOP	master air operations plan
MASINT	measurement and signature intelligence
MCC	maritime component command
MIRC	military internet relay chat
MSI	multi-spectral imaging
NRT	near real time
NTISR	non-traditional intelligence, surveillance and reconnaissance

Op	operation
PBA	predictive battlespace awareness
PED	processing, exploitation and dissemination
PIR	priority intelligence requirements
RAF	Royal Air Force
RCAF	Royal Canadian Air Force
RFI	request for information
RSTA	reconnaissance, surveillance and target acquisition
SA	situational awareness
SD	strategy division
SIDO	senior intelligence duty officer
SIGINT	signals intelligence
SOF	special operations forces
SOTA	stand-off target acquisition system
SPINS	special instructions
Sqn	squadron
TI	thermal imagery
TST	tactical support team
UAS	unmanned aircraft

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