



# Unmanned Air Vehicles (UAVs)

*Air Transport in Canada Symposium*

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## Purpose

- Provide an overview of the growing Unmanned Air Vehicles (UAV) industry in Canada and key challenges including:
  - Growing safety and security concerns with respect to UAVs;
  - Rapid industry and technological growth;
  - Increasing need for clear, predictable, and enforceable regulations;
- Present Transport Canada's (TC) interim strategy, and ongoing actions to mitigate safety concerns with respect to UAVs.
- Provide an overview of the proposed regulatory approach presented in the department's May 2015 Notice of Proposed Amendment for small UAVs, 25 kg or less, operated within visual line of sight (VLOS).



## Context

- TC regulates the use of all aircraft, manned and unmanned, to keep the public and our airspace safe and secure.
- UAVs are the subject of increasing reports of reckless or negligent use in built-up areas, in flight paths, and near aerodromes.
- UAVs are a rapidly growing and increasingly important part of the aviation and aerospace sectors in Canada with a diverse array of commercial applications, operators, and manufacturers.
- TC is implementing an interim strategy to address the growth of Canada's UAV industry by focusing on:
  - Accelerating regulatory implementation for small UAVs;
  - Strengthening education and awareness;
  - Accommodating research and development (R&D).

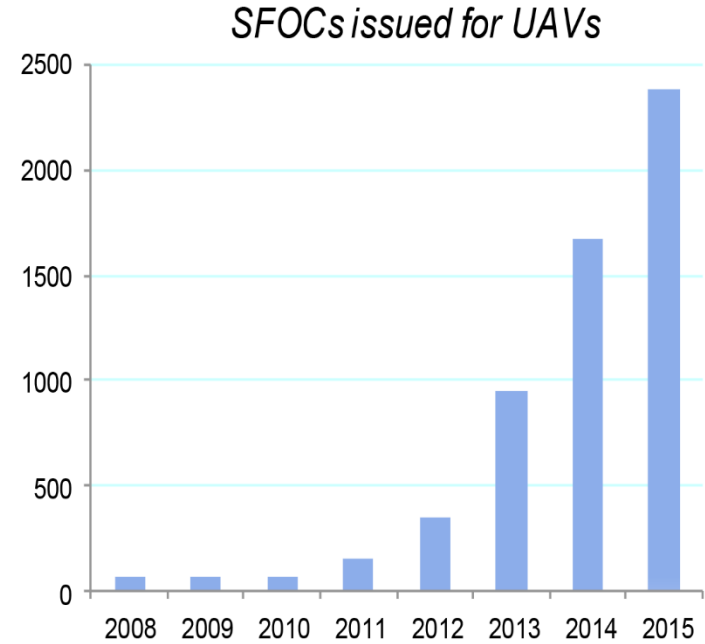


## The Global UAV Industry – Trends and Drivers

- Market research indicates global civil UAV spending could nearly double in growth within the next decade from \$6.4 billion annually to \$11.5 billion, with a diversification of commercial applications, operators, and aerospace manufacturers.
- Commercial demand for UAVs is highest in North America, followed by Europe:
  - Consumer UAVs (less than \$1500) account for the most commercial platforms sold.
  - Professional UAVs (between \$5,000 and \$50,000) account for the most commercial revenue.
- The leading manufacturers of consumer UAVs (under \$1500) are Parrot, Inc. and DJI, Inc. with point-of-sale at common retail outlets (Apple, Best Buy, Amazon).
- It is expected that the demand for services will continue to drive business growth; future demand will be for information, not specific UAV platforms.
- The UAV industry is expected to see considerable mergers and acquisitions that will shape the future market and influence innovation.

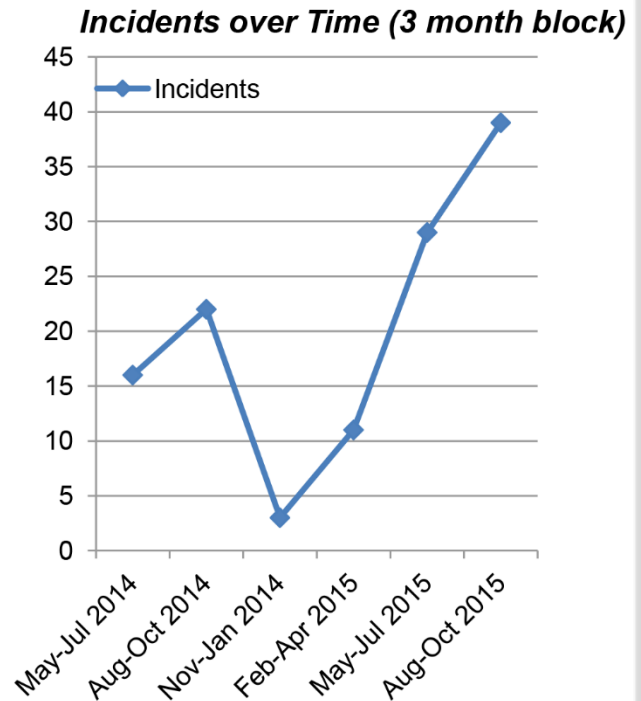
## Canada's UAV Industry

- Since 2008, Canada's UAV industry has grown from an estimated 88 to an estimated 600 companies involved in aerospace manufacturing and operations across a variety of economic sectors resulting in an exponential demand for SFOCs.
- A number of Canadian companies are active in manufacturing, research, and testing of professional UAV systems, including Aeryon Labs, ING Robotics, MicroPilot, Draganfly, and Stratus Aeronautics.
- Canada's industry is rapidly evolving. Currently, agriculture surveys, cinematography and film, and police investigations are the leading market applications for UAVs in Canada.
- The industry is seeking access to airspace and regulatory certainty to facilitate its growth in other key sectors; such as meteorology/oceanography, search and rescue, urban planning/real estate, and disaster relief.



## Growing Safety Concerns

- Between 2014 and 2015, TC has observed a 93% increase in reported UAV incidents interfering with manned aircraft in the May-October time period.
- The UAV population is growing faster than education, oversight, and enforcement capacity.
- In December 2015, TC received a letter from a coalition of 13 aviation associations highlighting their mutual safety concerns.
- Future regulations need to be clear and understandable for the emerging industry, enforceable for law enforcement agencies and inspectors, consistent with requirements for manned aircraft.
- A regulatory framework needs to be underpinned by proactive safety awareness tools, including social and traditional media outreach, guidance material, and community outreach forums.





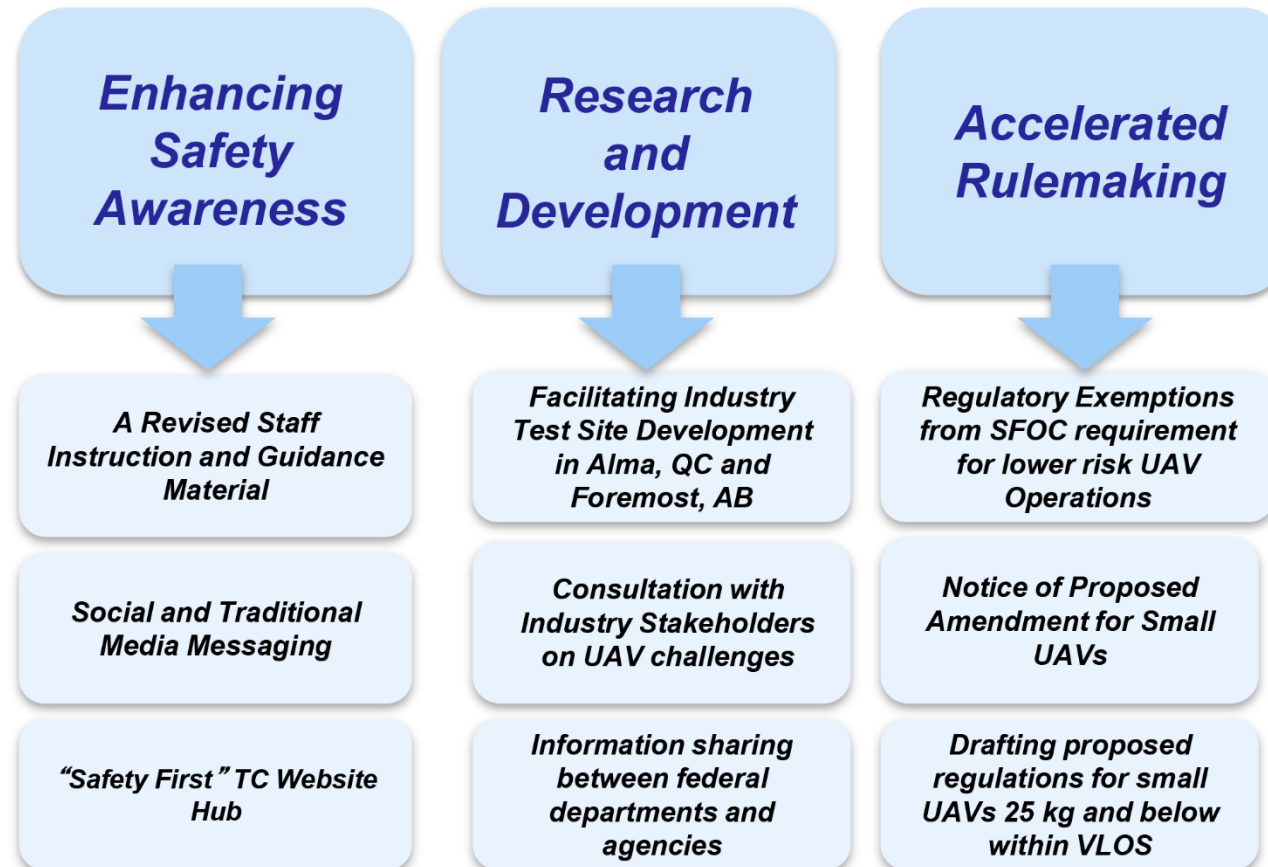
## Security Concerns

- TC works with Canada's security and intelligence community to assess security risks to Canada's civil aviation system.
- TC conducts annual risk assessments of a broad cross-section of threat scenarios including risks stemming from UAVs. At the present time, UAVs are assessed as posing more of a risk to aviation safety than security (acts of unlawful interference). The pendulum could shift at any point as the technology continues to evolve.
- TC continues to engage with its international and domestic security partners to better understand the threats, vulnerabilities and consequences of an attack delivered by a UAV:
  - The International Civil Aviation Organization (ICAO) Working Group on Threat and Risk (WGTR) conducted an in-depth risk assessment of UAVs in 2013 and updated in 2015.
  - This work supported a new ICAO AVSEC Panel Task Force on Remotely Piloted Aircraft Systems (RPAS), and informs the work of a broader ICAO RPAS Panel.
- As UAV capacity develops and the threats/risks change, TC will adapt its security mitigation posture accordingly, including the consideration of the need for security regulations.



## TC's Interim Strategy and Key Actions to Date

- TC is implementing an interim strategy based on three pillars with a range of activities:





## Ongoing Challenges



- **Jurisdictional Responsibility:** Provincial, territorial and municipal governments are seeking to actively address UAV issues with separate strategies or bylaw proposals.



- **Privacy issues:** Privacy continues to receive attention in media and from the Privacy Commissioner of Canada.



- **Enforcement:** Law enforcement agencies are encountering challenges related to the enforcement and investigation of UAVs.



- **Airspace Safety:** An increase in UAV incidents has led to an increased focus on ensuring safety for manned airspace users.



- **Striking a Balance:** Safeguarding the aviation system and Canadians, while fostering an environment of innovation and economic growth.



## Proposed Regulatory Amendments

- TC has accelerated its rulemaking activity to introduce regulations for small UAVs in 2016.
- The framework is risk-based with three categories based on the risk to persons, property, and civil aviation:
  - UAVs in **complex** operations near aerodromes, built-up areas, and assemblies of people would have more stringent operating requirements.
  - UAVs in **limited** operations in rural areas away from people, aerodromes and built-up areas would have more flexibility under the proposed framework.
  - A **lower-threshold** category of UAV would be permitted to operate in a built-up area due to their lower risk of injury or damage, but not permitted to operate near aerodromes.
- The proposed regulations will include registration, insurance, pilot training, age requirements, airspace restrictions, and enforcement provisions, including administrative monetary penalties.
- The proposed framework would no longer distinguish between recreational and non-recreational operations as there are common risks between both types of operations.



## The Global Perspective

- The U.S. Federal Aviation Administration (FAA) has made UAVs a priority with its Unmanned Air Systems (UAS) Integration Office, which conducts regulatory development, testing, and studies of UAV systems.
- The UAS Integration Office is implementing a number of initiatives:
  - A Strategic Roadmap to integrate UAVs into its national airspace;
  - Pathfinder Pilot Projects for higher risk operations;
  - Six Test Sites led by academic institutions and the private sector; and,
  - A Notice of Proposed Rulemaking for small UAVs under 25 kg within VLOS.
- The FAA started permitting routine commercial UAV operations in 2015 and recently mandated registration for recreational UAVs over 250 grams.
- The European Aviation Safety Agency (EASA) is leading the development of a risk-based “Concept of Operations” for UAVs across European member states.
- The United Kingdom, Australia, and New Zealand have also accelerated their rulemaking strategies, and are confronting similar airspace safety challenges.



## The Global Perspective (continued)

- UAVs are also the focus of collaborative regulatory and standards development internationally through the ICAO and the Joint Authorities for Rulemaking on Unmanned Systems (JARUS).
- ICAO formed the RPAS Panel as the focal point of all UAV related work with the objective to facilitate the safe, secure and efficient integration of UAVs into airspace and the development of Standards and Recommended Practices (SARPs), procedures and guidance for UAVs.
- TC strives to take an active role in ICAO work:
  - Contributes to the Panel with one subject matter expert, an advisor, and an observer.
  - Published a working paper at the January 2015 high level safety conference on its approach to managing the risks of UAVs.
  - Sent a delegation to the March 2015 ICAO RPAS Symposium to help inform its regulatory framework and strategy.
- JARUS is developing a set of technical, safety and operational requirements for the certification and safe integration of UAVs for use by civil aviation authorities.



## Enforcement

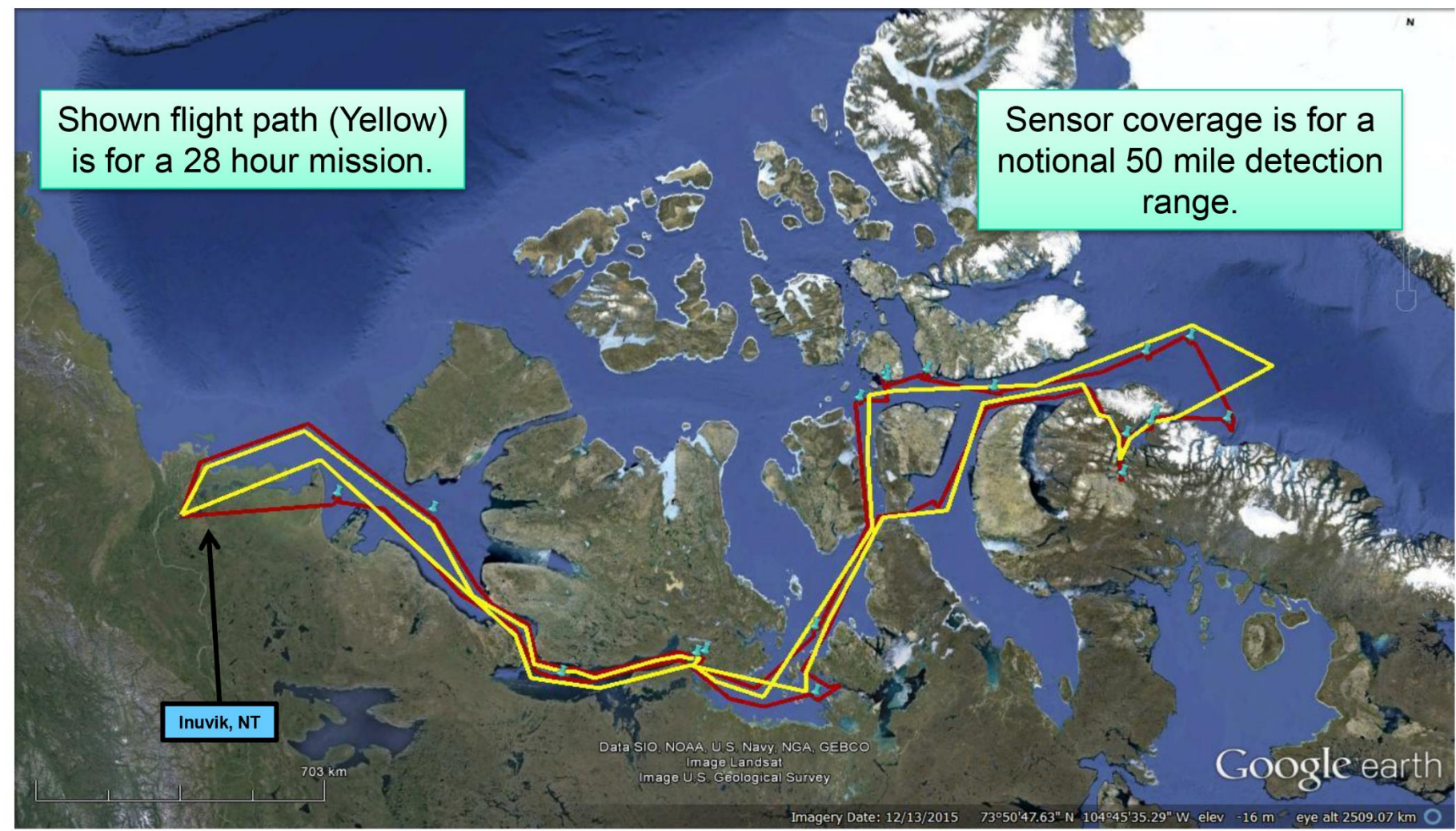
- TC is engaging law enforcement agencies, including local police and the Royal Canadian Mounted Police (RCMP), to more proactively and collaboratively address UAV issues across Canada.
- Federal partners (e.g. RCMP) are exploring tools to detect and “deter” UAVs.
- The Spring 2016 Safety Awareness campaign will look at ways to manage enforcement, along with focusing on awareness and education.
- The department has increased partnership with provinces, territories, municipalities and aviation stakeholders to identify enforcement mechanisms and coordinate safety campaigns, including the airport “No UAV Zone” signage campaigns.
- Currently, TC has a delegation authority under the *Aeronautics Act*, and is exploring the possibility of delegating enforcement powers to peace officers to issue penalties for designated offences under the regulatory project.



## Transport Canada's UAV Project

- In 2015, TC received funding for the Procurement of an Unmanned Air Vehicle System for Surveillance in Canada's North.
- The project will enhance TC's surveillance capacity in Canada's Arctic airspace in support of the National Aerial Surveillance Program (NASP), and contribute to the advancement of the commercial regulatory environment for UAV's.
- The system that is procured will include the unmanned air vehicle(s), ground control station(s), data links, telemetry, communications and navigation equipment, air traffic control systems, and sensor packages necessary for operations in the Arctic.
- TC is well on its way on this procurement.
  - A request for information was launched on March 8, 2016 and closed on March 23, 2016.
  - Meetings with interested Industry representatives are scheduled for May 2016.
- TC is aiming to have the system procured by April, 2018.

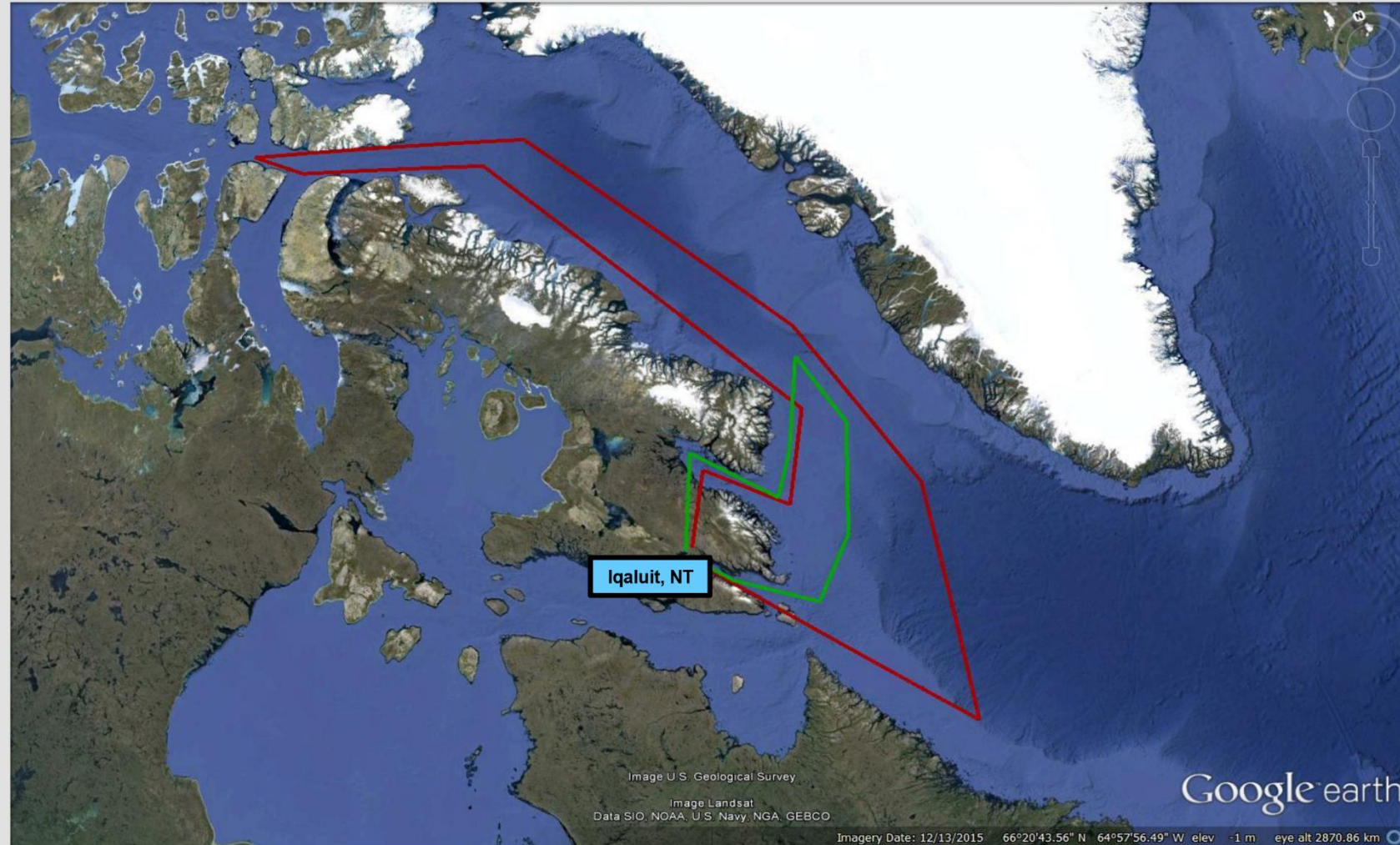
# Potential UAV Mission Through Northwest Passage



UAS out of Inuvik can perform surveillance of the northern ocean.

## UAV Capabilities VS Manned Aircraft

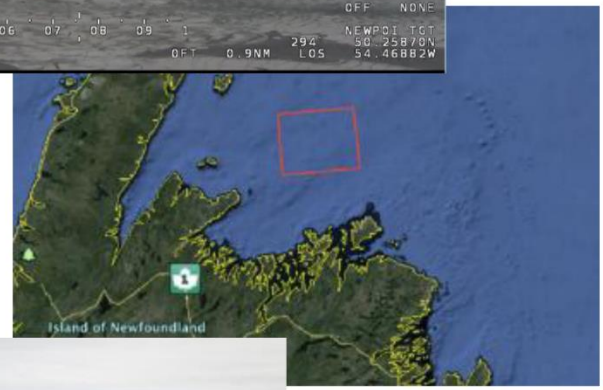
- Manned Aircraft @ 180 kts on a 7 hour NASP mission —
- Proposed UAS flight @ 150 kts on a 24 hour NASP mission —





# Transport Canada's Technology Demonstrations

- In parallel with main UAS project, TC has lead a number of UAS demonstrations to:
  - Explore the efficacy of using unmanned vehicles to aid in Coast Guard operations, and
  - Facilitate TC's development of UAS concept of operations.
- To date, TC has conducted 4 such demonstrations, the most recent of which was conducted off the back of a CCG icebreaker. This latest demonstration included a number of Canadian "firsts", including a first in Canada "beyond visual line of sight (BVLOS)" operation of a civilian UAS off a CCG vessel.





## Next Steps: Moving Forward

- In Spring 2016, TC will hold a technical briefing for stakeholders, including ALPA representatives, on changes to the regulatory framework initially proposed in the May 2015 NPA.
- In Summer 2016, the department will seek to renew its Safety Awareness campaign and work with stakeholders to enhance its messaging.
- The Deputy Minister continues to engage provincial and territorial counterparts on UAVs through the Council of Deputy Ministers.
- TC holds regular interdepartmental meetings on UAVs to identify gaps and opportunities and enhance collaboration on UAV issues.
- TC's UAV procurement process will proceed from RFI to RFP in fall 2016 and to procurement by April 2018.
- TC will continue with further technology demonstrations at a suitable test range in summer 2016.
- The department intends to publish regulations for small UAVs, 25 kg or less, operated within VLOS, in Canada Gazette I by the end of 2016.
- TC will commence BVLOS regulatory work once the VLOS regulations are published.

Canada 



## Annex A: Summary of the Current Regulatory Framework

- Civilian unmanned aircraft are “aircraft” under the *Aeronautics Act* and are governed by the *Canadian Aviation Regulations* (CARs) when operating in civil airspace or military restricted airspace.
- Recreational operations are defined as model aircraft under the CARs and are required to not pose a hazard to aviation safety or be flown into cloud.
- Non-recreational operations are required to operate under a Special Flight Operation Certificate (SFOC) issued by Transport Canada.
- In 2014, TC published two regulatory exemptions to the SFOC process to allow lower risk operations to take place without an SFOC, while subject to specific operating conditions:
  - UAVs 2 kg and below have 37 operating conditions, including operating within VLOS, away from built-up areas, aerodromes, and groups of people.
  - UAVs 2 – 25 kg have 58 operating conditions, including a notification requirements and a prohibition on certain payloads, and more prescriptive pilot knowledge requirements.