

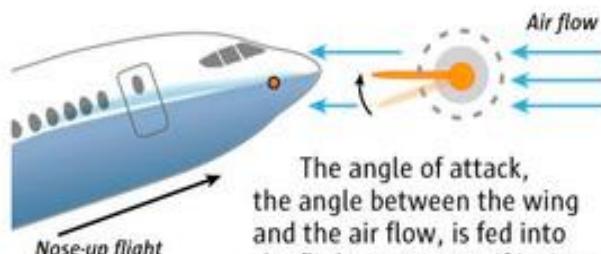
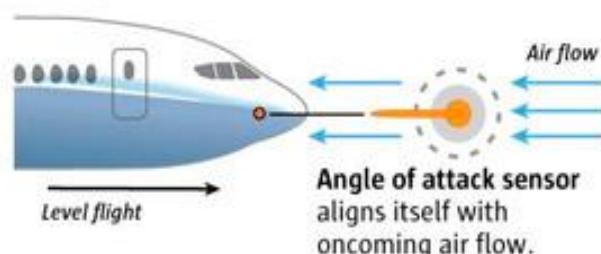
SPECIFY THE BUSINESS PROBLEM:

An airplane crash analysis is a detailed investigation into the causes of an aviation accident. The goal of an airplane crash analysis is to identify any factors that contributed to the accident, with the ultimate goal of improving safety and preventing future accidents. The process of conducting an airplane crash analysis typically involves the collection and analysis of a wide range of data, including information about the aircraft and its systems, the operators, and any other relevant factors. This data is typically collected from Kaggle. Once the data has been collected, it is analysed through tableau, to identify any potential causes of the accident. The results of an airplane crash analysis are typically published in a report, which may include recommendations for improving safety and preventing similar accidents in the future. These recommendations may be implemented by the relevant authorities or industry organizations.

BUSINESS REQUIREMENTS

The investigation should include the gathering, recording and analysis of all available information; the issuance of safety recommendations, if appropriate; the determination of the causes, if possible; and the completion of a final report.

How the new MAX flight-control system operates to prevent a stall



The angle of attack, the angle between the wing and the air flow, is fed into the flight computer. If it rises too high, suggesting an approaching stall, the MCAS system activates.

MCAS (Maneuvering Characteristics Augmentation System)

The MCAS system automatically swivels the horizontal tail to move the nose down. In the Lion Air crash, the angle of attack sensor fed false information to the flight computer.



Sources: Boeing, FAA, Indonesia National Transportation Safety Committee, Leeham.net, and The Air Current.

Reporting by DOMINIC GATES,
Graphic by MARK NOWLIN / THE SEATTLE TIMES

LITERATURE SURVEY :

2

SECTION 2

Literature Review and Review of Accident/Incident Data Systems

A literature review and review of accident/incident data systems was performed to identify documents and data systems that would provide insight into apron management systems and data related to accident and incident occurrences in the airport terminal apron areas. The documents identified were useful in understanding the challenges of apron management and the diversity of data collection among aviation regulatory and industry organizations. Key documents and data systems reviewed are summarized in this section.

2.1 ICAO Annex 14—Section 9.5 on Apron Management Service

The ICAO standards and recommended practices for airports are specified in Annex 14, Volume 1, *Aerodrome Design and Operations*. Section 9.5.1 provides the ICAO recommendation with regard to apron management services:

- 9.5.1 Recommendation—When warranted by the volume of traffic and operating conditions, an appropriate apron management service should be provided on an apron by an aerodrome ATS unit, by another aerodrome operating authority, or by a cooperative combination of these, in order to:
- Regulate movement with the objective of preventing collisions between aircraft and between aircraft and obstacles;
 - Regulate entry of aircraft into, and coordinate exit of aircraft from, the apron with the aerodrome control tower; and
 - Ensure safe and expeditious movement of vehicles and appropriate regulation of other activities.

ICAO conducts “regular, mandatory, systematic, and harmonized safety audits” of its contracted (member) nations as part of its Universal Safety Oversight Audit Programme. The most recent ICAO audit of the United States took place in November 2007. Included in its findings was an ICAO recommendation that the United States establish federal requirements for an “apron management service” as described in ICAO Annex 14, Paragraph 9.5.1.

2.2 ICAO Airport Services Manual, Part 8, Airport Operational Services

Further details on apron management units are provided in ICAO’s *Airport Services Manual*, Part 8, Airport Operational Services. Chapter 10 distinguishes between the aircraft movement area, control over which is the responsibility of the air traffic control service, and the apron, where it is recommended that an apron control unit regulate the movement of aircraft and vehicles. The need for highly coordinated communications between the apron control unit and the air traffic control service is emphasized.

This chapter also identifies typical responsibilities of apron management units as:

- Allocation of aircraft stands (gates) on the aprons,
- Maintenance of gate allocation documentation for landing and parking charges to the airlines,
- Providing marshalls for arriving aircraft to gates without docking guidance systems, and
- Apron services such as baggage and aircraft handling at some airports.

2.3 ICAO Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual

ICAO’s *Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual* describes the system for aircraft and vehicle control in low-visibility operating conditions. In general this is an integrated system of surveillance, control and guidance, and communication with emphasis on the use of technology applications in these areas.

The manual specifies that A-SMGCS applies to apron areas where aircraft may come into conflict with vehicles or other aircraft and recommends that apron management units require designated areas for vehicles defined by painted lines

on the apron designating clear areas. The manual also identifies several areas in which apron management and control is integrated within the system. Apron management and control units should receive aircraft identification and position information, vehicle identification and position information, information on potential obstacles or hazards, and other information necessary in the apron area.

2.4 NTSB Definition of Aircraft Accidents and Incidents

Aircraft *accidents* and *incidents*, as used by the National Transportation Safety Board (NTSB), are defined in 49 CFR Part 830, Notification and Reporting of Aircraft Accidents or Incidents and Overdue Aircraft, and Preservation of Aircraft Wreckage, Mail, Cargo, and Records. The NTSB definition of an accident is “an occurrence associated with the operation of an aircraft . . . in which any person suffers death or serious injury, or in which the aircraft receives substantial damage.” Serious injury is further defined as one of the following instances:

1. Requires hospitalization for more than 48 hours, commencing within 7 days of the date of the injury;
2. Results in a fracture of any bone (except simple fractures of fingers, toes, or nose);
3. Causes severe hemorrhages; nerve, muscle, or tendon damage;
4. Involves any internal organ; or
5. Involves second- or third-degree burns or any burns affecting more than 5% of the body surface.

NTSB defines an incident (as differentiated from an accident) as an “occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations.” Additionally, substantial damage is defined by the NTSB as “damage or failure which adversely

affects the structural strength, performance, or flight characteristics of the aircraft. . . .”

Title 49 CFR 830 also sets the standard for reporting accidents and incidents to the NTSB. All accidents as defined previously must be reported. There are a category of incident cases that must also be reported. The key threshold related to reportable apron incidents is “damage to property, other than aircraft, estimated to exceed \$25,000 for repair or fair market value in the event of a total loss.”

2.5 GAO Report on Runway and Ramp Safety

In November 2007 the Government Accountability Office (GAO) released a report entitled *Aviation Runway and Ramp Safety: Sustained Efforts to Address Leadership, Technology, and Other Challenges Needed to Reduce Accidents and Incidents* (GAO-08-29). The GAO found that there is a lack of accident data related to ground handling operations, particularly for nonfatal accidents, hindering efforts to improve apron safety. Furthermore, since the federal government has had an indirect role in apron safety issues, there are no federal or industry-recognized standards on policies and procedures for apron operations.

2.6 ACI Survey on Apron Incidents and Accidents

Airports Council International (ACI) has historically surveyed member airports to gather information on the occurrences of apron incidents and accidents. The most recent report available was published in May 2009 and covers the years 2006 and 2007. Table 2-1 summarizes the number of airports responding to the ACI survey and the overall rate of accident/incident damage per 1,000 aircraft movements.

The data collected by ACI are self-reported by airport operators and reflect only that information the airport operator has

Table 2-1. Summary of ACI survey of apron incidents and accidents.

| Region | 2006 | | 2007 | |
|-------------------------|---------------------|---|---------------------|---|
| | Airports Responding | Damage Rate (Overall, per 1,000 Aircraft Movements) | Airports Responding | Damage Rate (Overall, per 1,000 Aircraft Movements) |
| Africa | 12 | 0.259 | 12 | 0.182 |
| Asia-Pacific | 12 | 0.084 | 13 | 0.102 |
| Europe | 69 | 0.341 | 70 | 0.381 |
| Latin America/Caribbean | 53 | 0.125 | 53 | 0.107 |
| North America | 10 | 0.099 | 10 | 0.094 |
| Total | 156 | 0.230 | 158 | 0.245 |

Source: ACI Survey of Apron Incidents and Accidents 2006–2007, ACI World, May 2009
Prepared by Ricondo & Associates, Inc.

SOCIAL AND BUSINESS IMPACT:

Social impact:

The investigation should include the gathering, recording and analysis of all available information; the issuance of safety recommendations, if appropriate; the determination of the causes, if possible; and the completion of a final report.

Business impact:

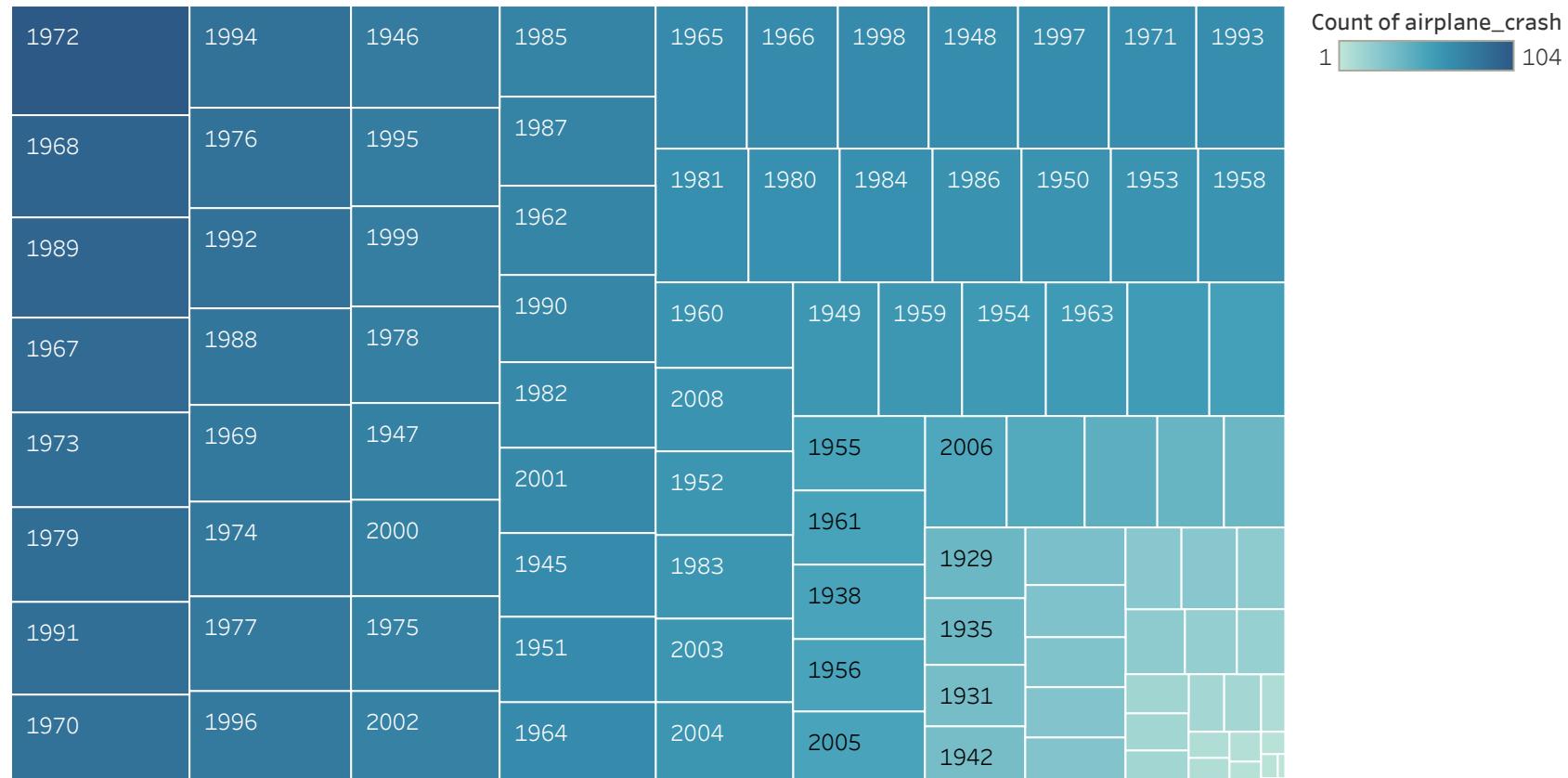
generates economic growth, creates jobs, and facilitates international trade and tourism.

MAXIMIZING THE BENEFITS OF AVIATION

This checklist provides a guide for maximizing aviation benefits in a sustainable manner. Implementation will require leadership and concerted, coordinated actions from public authorities at all levels, together with aviation stakeholders, financial sectors, and international and regional organizations.

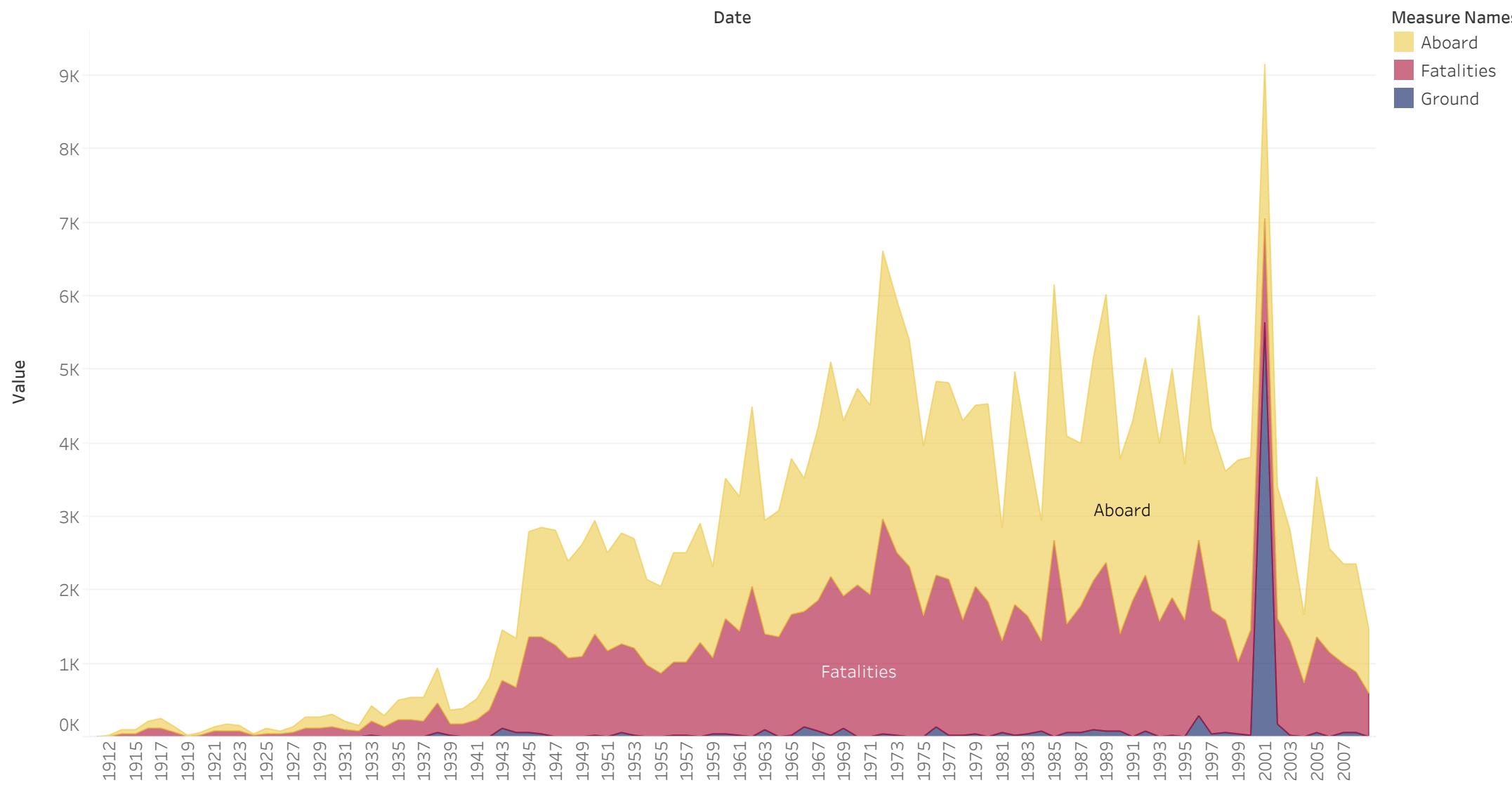
- | | | |
|-----------|---|--|
| 01 | ECONOMIC DEVELOPMENT PLANNING | Mainstream the priorities of the aviation sector in States' economic development planning so that aviation can be used as an economic development driver. |
| 02 | AIR TRANSPORT REGULATORY FRAMEWORK | Establish and apply good governance for air transport, i.e. the institutional, regulatory, and policy frameworks, in which air transport is designed, implemented and managed. |
| 03 | AVIATION INFRASTRUCTURE | Develop quality aviation infrastructure (including air navigation systems and airports) commensurate with the level of predicted traffic growth and based on ICAO's global plans. |
| 04 | RESOURCE MOBILIZATION | Promote diversified funding and financing sources in partnership with States, international and regional organizations, and industry, as well as multi-lateral development banks and other financial institutions. |
| 05 | SAFETY AND SECURITY | Comply with ICAO's global standards and policies, as well as industry standards to continue enhancing civil aviation safety and security. |
| 06 | ENVIRONMENTAL PROTECTION | Reinforce efforts toward minimizing the environmental effects from civil aviation activities, especially the achievement of the aspirational goals of carbon neutral growth from 2020. |
| 07 | PUBLIC ENGAGEMENT | Foster an informed and engaged public as a crucial partner to advance sustainable air transport solutions. |

Maximum accidents based on Years



Date Year. Color shows count of airplane_crash. Size shows count of airplane_crash. The marks are labeled by Date Year.

sheet2



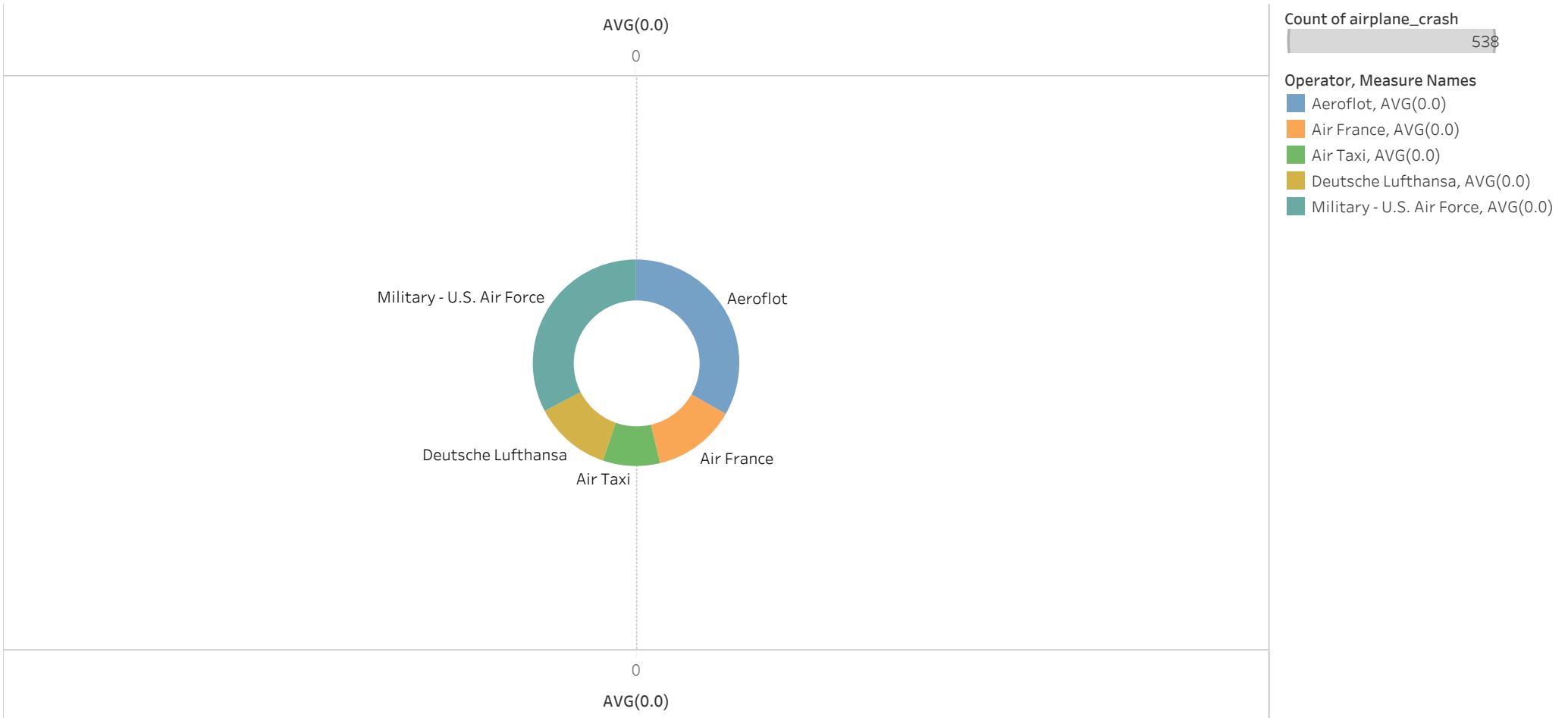
Aboard, Fatalities and Ground for each Date Year. Color shows details about Aboard, Fatalities and Ground. The marks are labeled by Aboard, Fatalities and Ground. Details are shown for Aboard, Fatalities and Ground.

Accidents happened in 1972 based on months



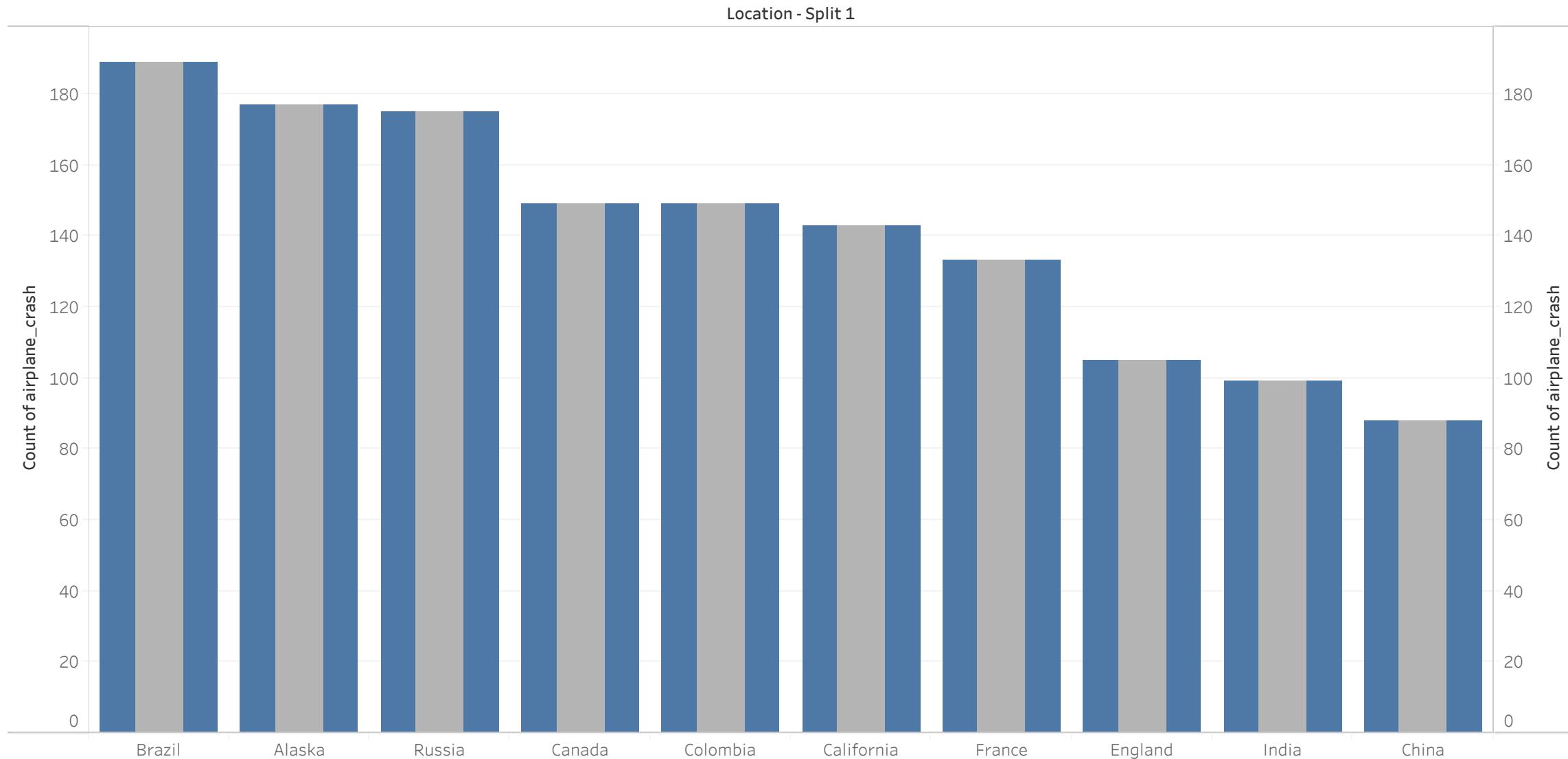
Aboard, Fatalities, Ground, Aboard, Fatalities and Ground for each Date Month. Color shows details about Aboard, Fatalities and Ground. The data is filtered on Date Year, which keeps 1972.

Highest no. of. accident based on operators



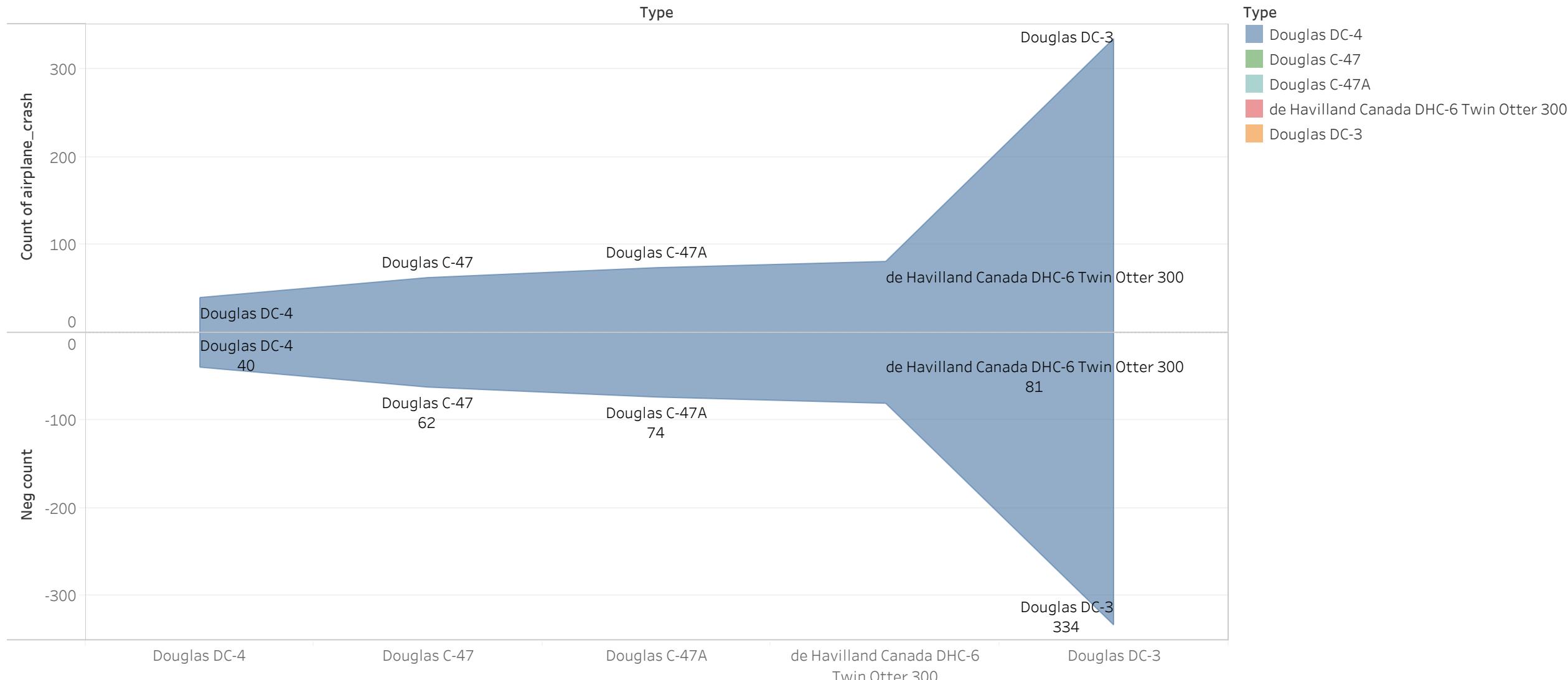
AVG(0.0) and AVG(0.0). For pane AVG(0.0): Color shows details about Operator and AVG(0.0). Size shows count of airplane_crash. The marks are labeled by Operator. The view is filtered on Operator, which keeps Aeroflot, Air France, Air Taxi, Deutsche Lufthansa and Military - U.S. Air Force.

Top 10 locations which had more accidents



Count of airplane_crash and count of airplane_crash for each Location - Split 1. The view is filtered on Location - Split 1, which keeps 10 of 497 members.

Top 3 flights which have max accidents history



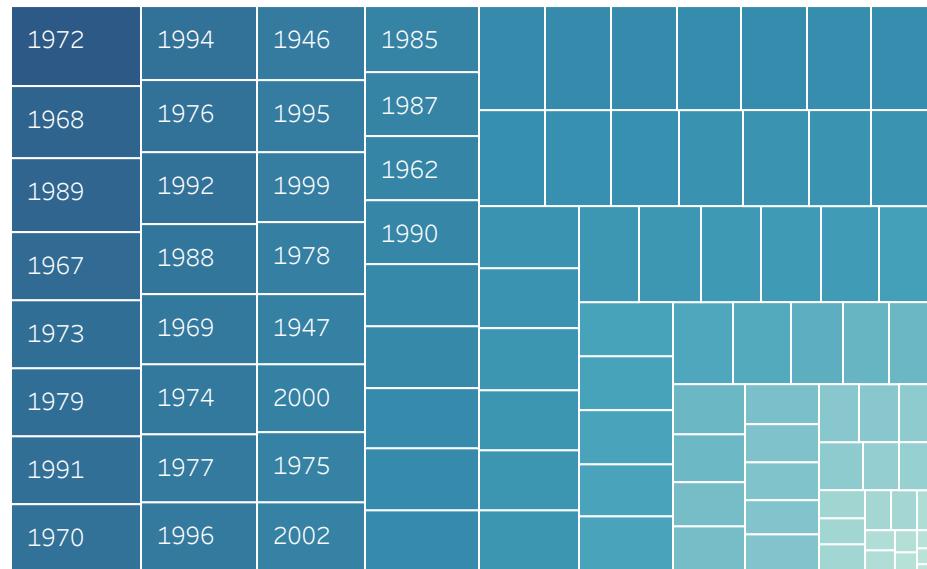
Count of airplane_crash and Neg count for each Type. Color shows details about Type. The marks are labeled by Type. For pane Neg count: The marks are labeled by Type and count of airplane_crash. The view is filtered on Type, which keeps de Havilland Canada DHC-6 Twin Otter 300, Douglas C-47, Douglas C-47A, Douglas DC-3 and Douglas DC-4.

Accidents based on regions

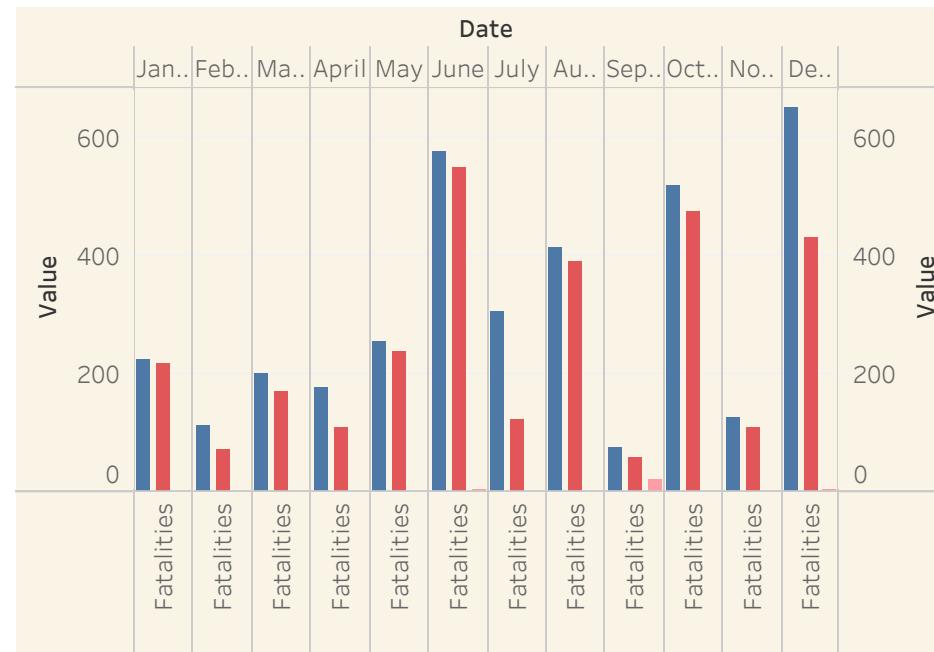


Map based on Longitude (generated) and Latitude (generated). Color shows count of airplane_crash. The marks are labeled by count of airplane_crash and Location - Split 1. Details are shown for Location - Split 1.

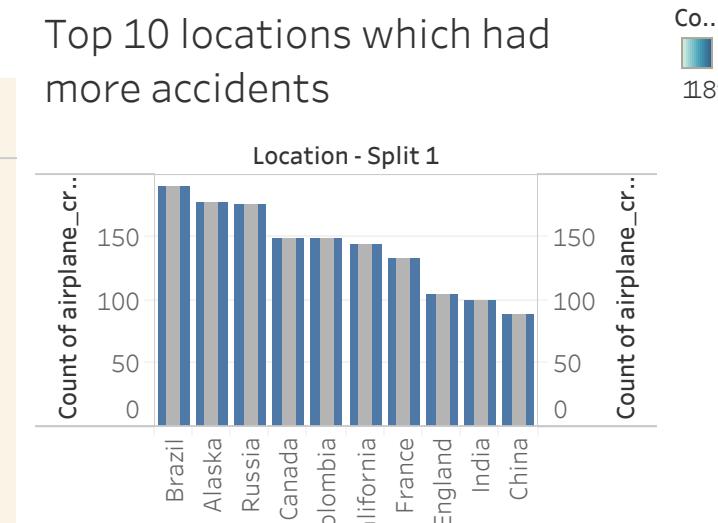
Maximum accidents based on Years



Accidents happened in 1972 based on months



Top 10 locations which had more accidents



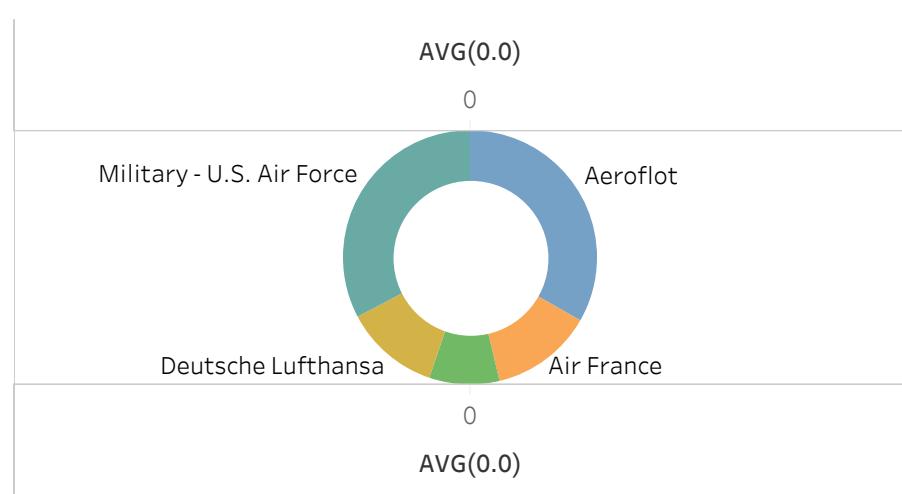
Co..

180

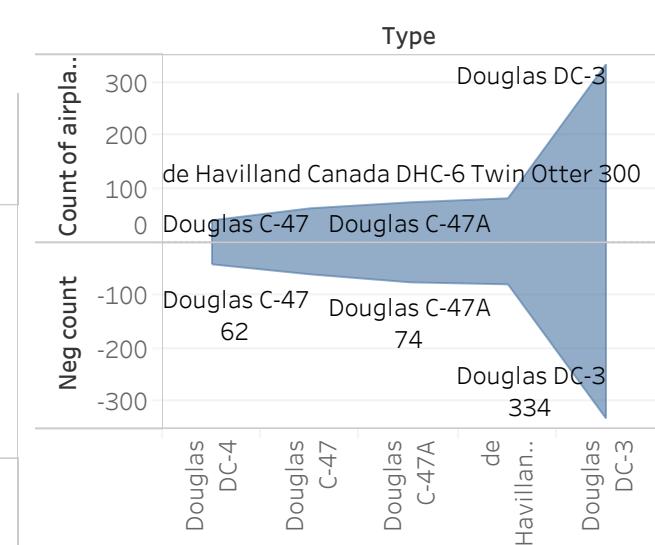
Accidents based on regions



Highest no. of. accident based on operators

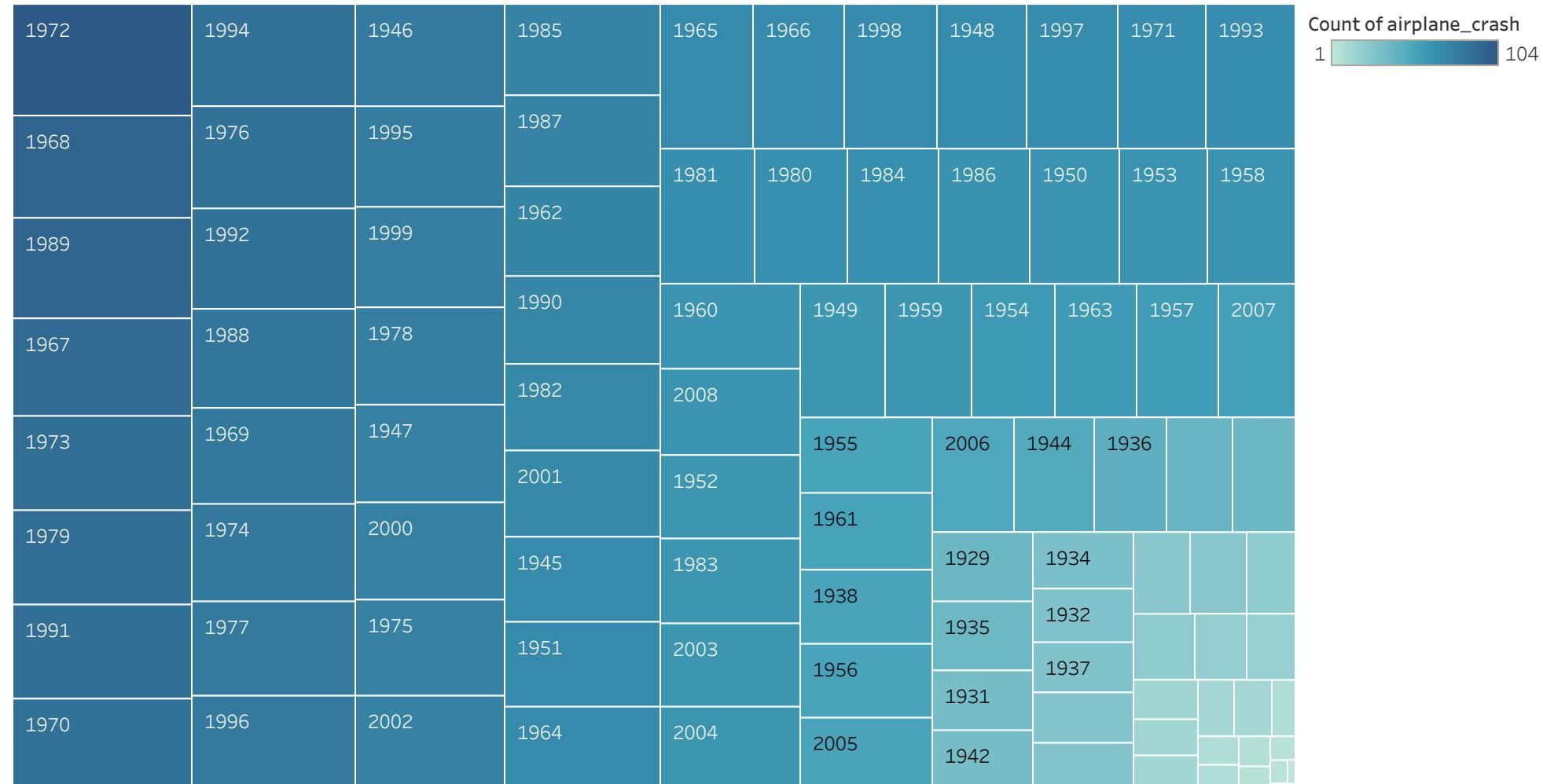


Comparing aboard Vs Fatalities Vs Ground



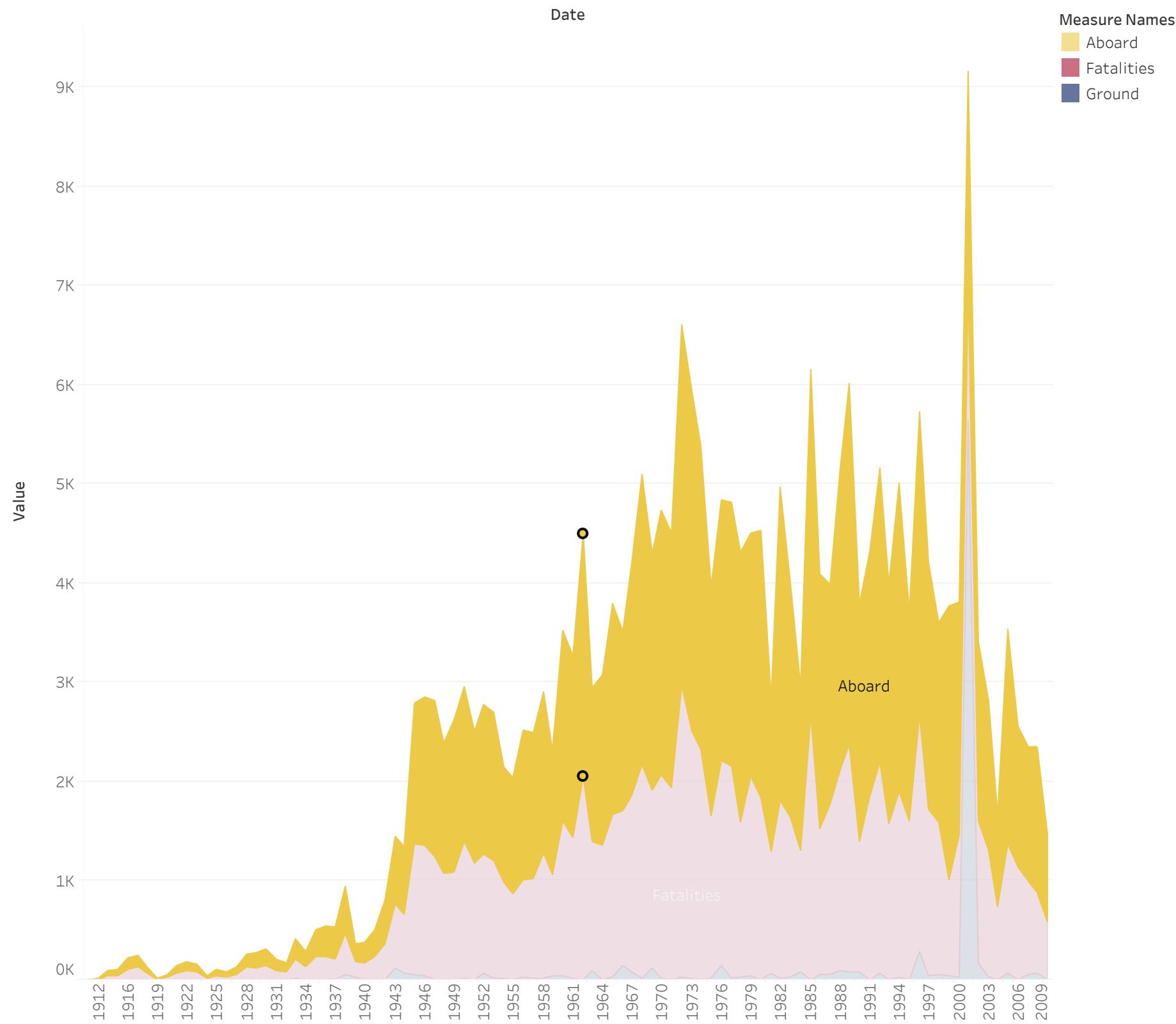
Story 1

| In the year of 1972 Max Accidents happened | comparing Abroad Vs Fatalities Vs Ground | Accidents happened in 1972 based on months | Highest accidents happened by operators | Top 10 locations which had more accidents | Top 3 flights which have max accident history | Accidents based on regions |
|--|--|--|---|---|---|----------------------------|
|--|--|--|---|---|---|----------------------------|



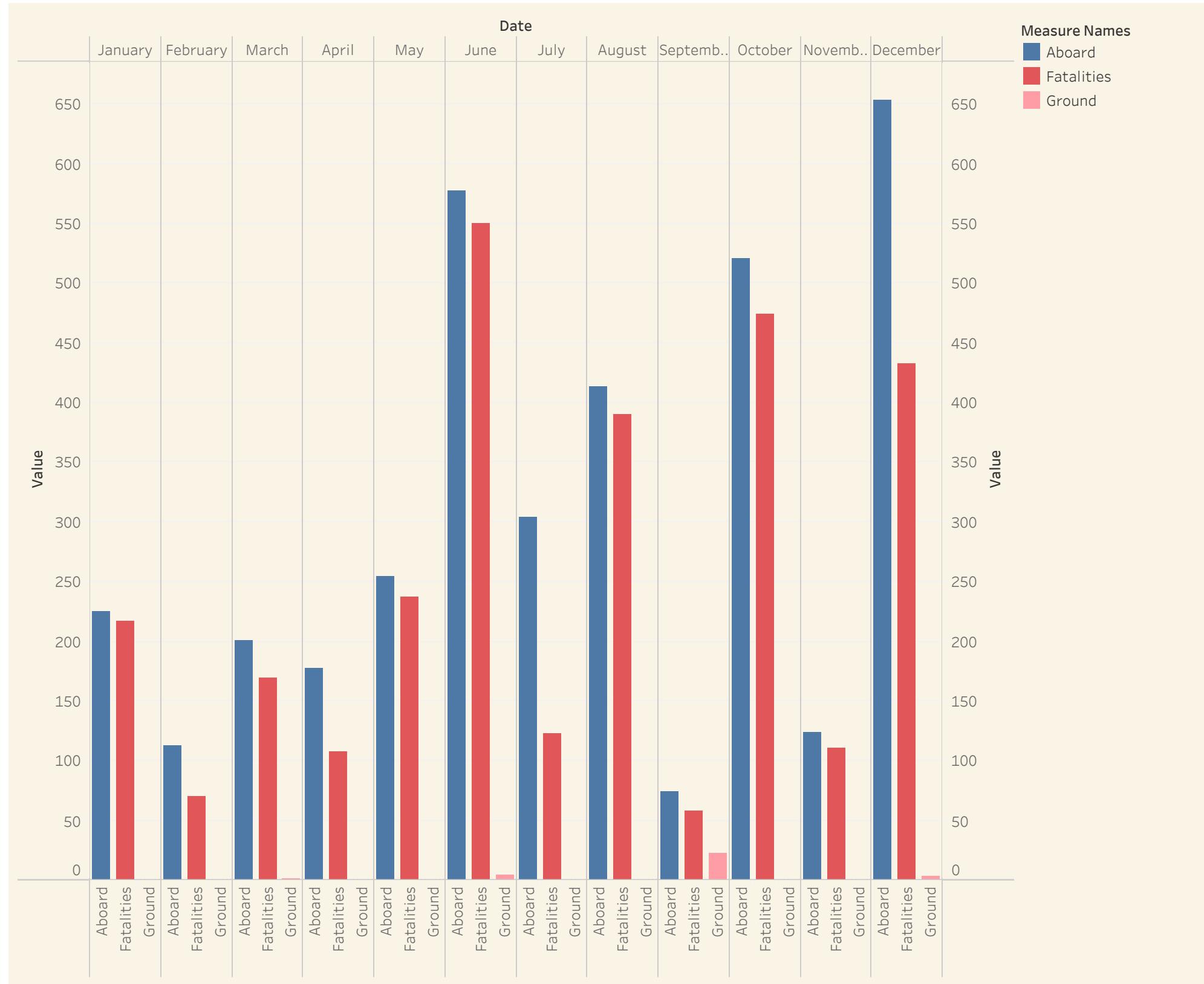
Story 1

| | | | | | | |
|--|--|--|---|---|---|----------------------------|
| In the year of 1972 Max Accidents happened | comparing Abroad Vs Fatalities Vs Ground | Accidents happened in 1972 based on months | Highest accidents happened by operators | Top 10 locations which had more accidents | Top 3 flights which have max accident history | Accidents based on regions |
|--|--|--|---|---|---|----------------------------|



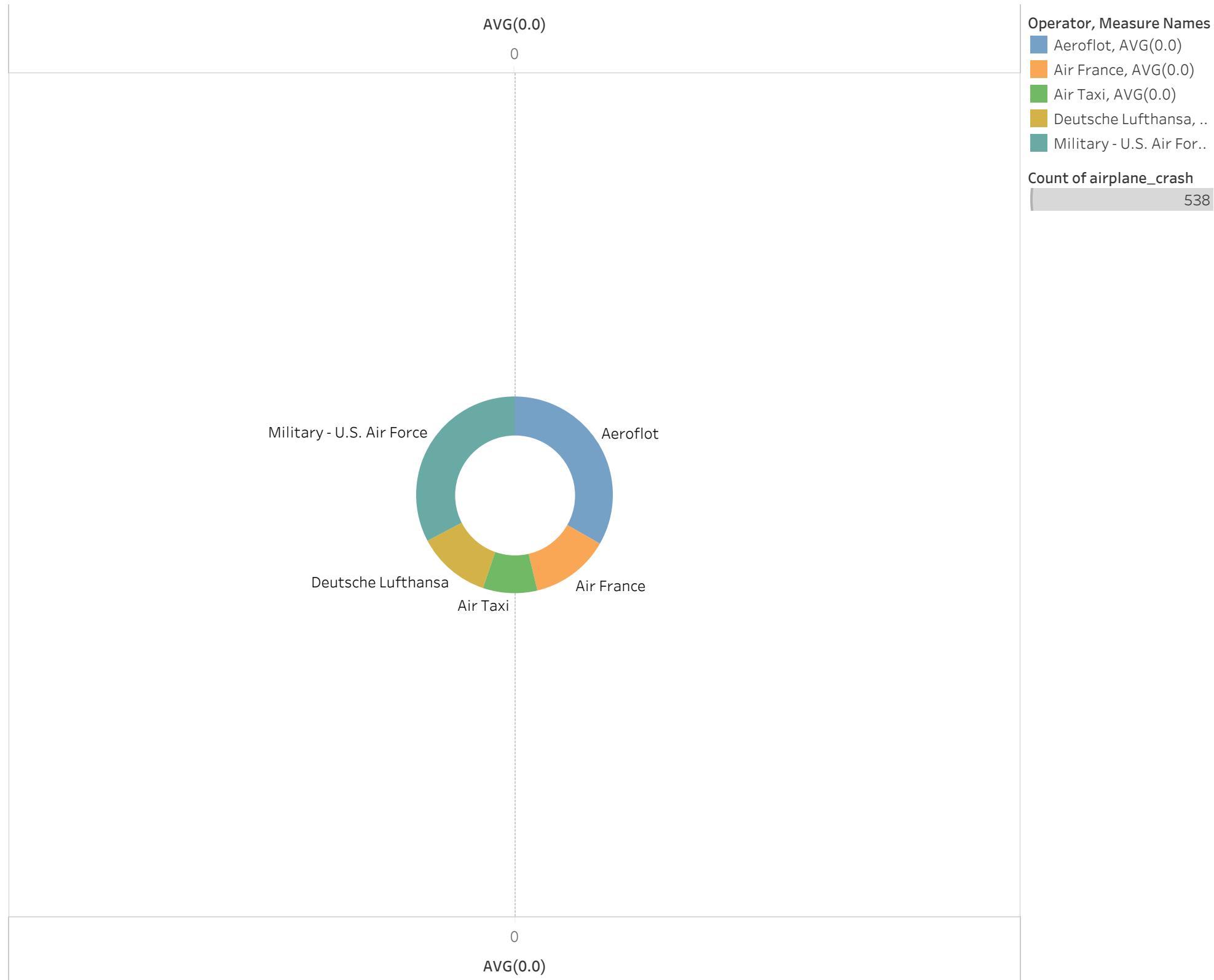
Story 1

| | | | | | | |
|--|--|--|---|---|---|----------------------------|
| In the year of 1972 Max Accidents happened | comparing Abroad Vs Fatalities Vs Ground | Accidents happened in 1972 based on months | Highest accidents happened by operators | Top 10 locations which had more accidents | Top 3 flights which have max accident history | Accidents based on regions |
|--|--|--|---|---|---|----------------------------|



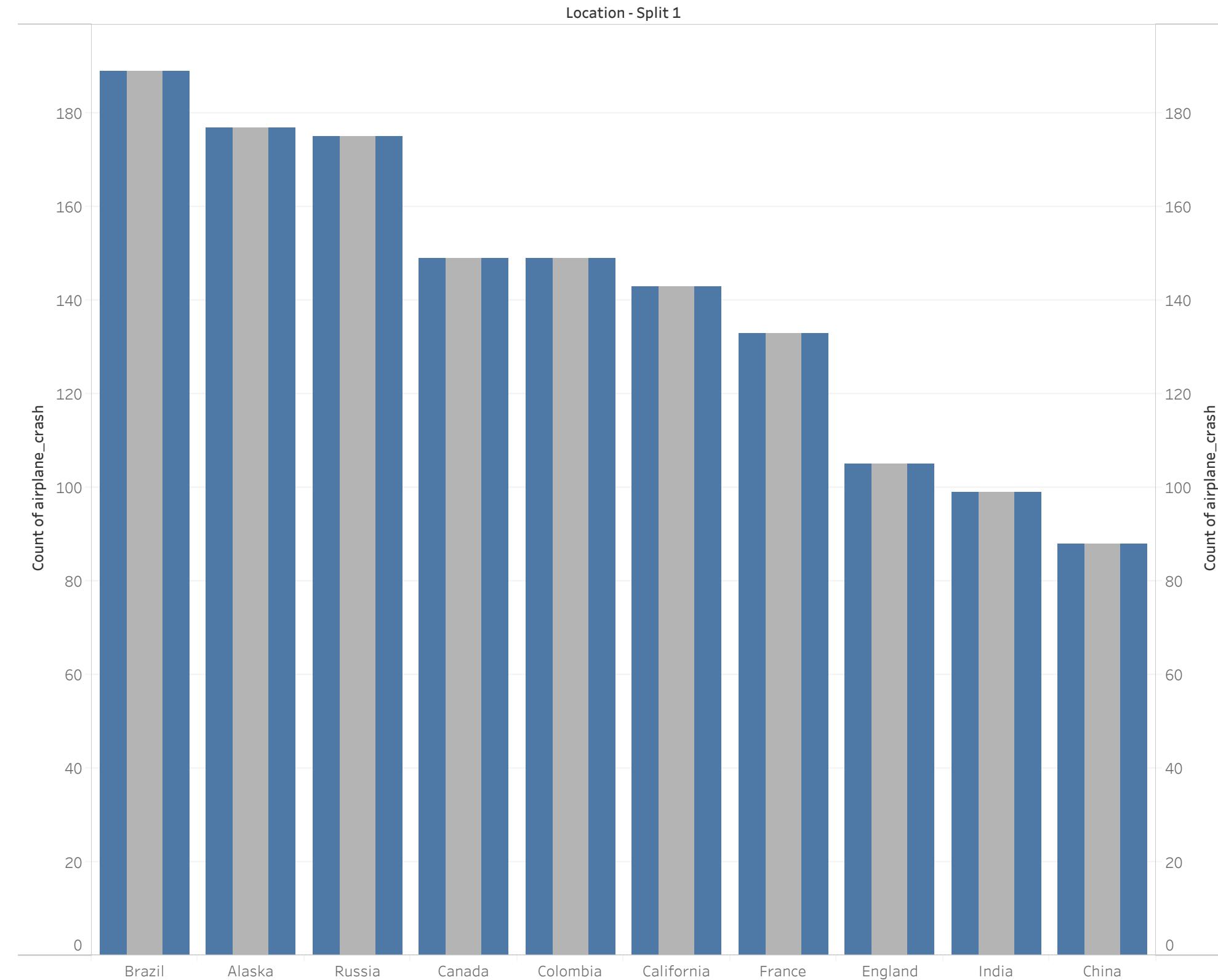
Story 1

| | | | | | | |
|---|--|--|---|---|---|----------------------------|
| In the year of 1972 Max Accidents happe.. | comparing Abroad Vs Fatalities Vs Ground | Accidents happened in 1972 based on months | Highest accidents happened by operators | Top 10 locations which had more accidents | Top 3 flights which have max accident history | Accidents based on regions |
|---|--|--|---|---|---|----------------------------|



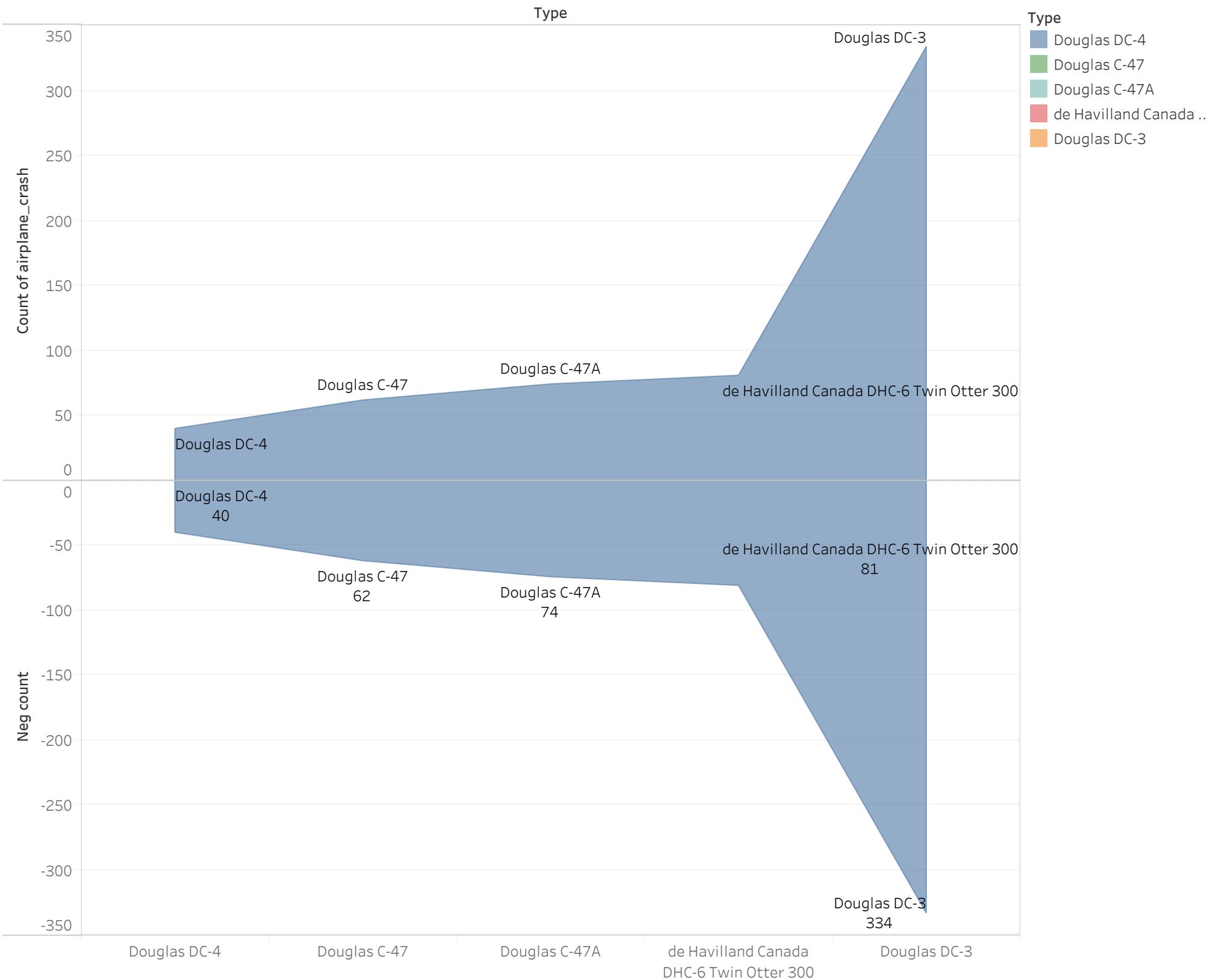
Story 1

| | | | | | | |
|--|--|--|---|---|---|----------------------------|
| In the year of 1972 Max Accidents ha.. | comparing Abroad Vs Fatalities Vs Ground | Accidents happened in 1972 based on months | Highest accidents happened by operators | Top 10 locations which had more accidents | Top 3 flights which have max accident history | Accidents based on regions |
|--|--|--|---|---|---|----------------------------|



Story 1

| | | | | | | |
|--|--|--|---|---|---|----------------------------|
| In the year of 1972 Max Accidents ha.. | comparing Abroad Vs Fatalities Vs Ground | Accidents happened in 1972 based on months | Highest accidents happened by operators | Top 10 locations which had more accidents | Top 3 flights which have max accident history | Accidents based on regions |
|--|--|--|---|---|---|----------------------------|



Story 1

In the year of
1972 Max
Accidents ha..

comparing Abroad Vs
Fatalities Vs Ground

Accidents happened in
1972 based on months

Highest accidents
happened by
operators

Top 10 locations which
had more accidents

Top 3 flights which
have max accident
history

Accidents based on
regions

Count of airplane_crash
1 189

