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Timothy Ikiao Reviewed

943fda5 · 6 minutes ago



4548 lines (4548 loc) · 458 KB

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Final Project Submission

Please fill out:

- Student name: Timothy M. Ikiao
- Student pace: part time
- Scheduled project review date/time:
- Instructor name: Brian Chacha
- Blog post URL:

Aircraft Safety

We shall use the provided National Transportation Safety Board (1962 - 2023) civil aviation data to achieve our objectives.

Objective

- Determine the lowest risk aircraft for a new business endeavor in commercial and private enterprises
- Incorporate information on purchasing and operating aircraft for commercial and private enterprises where available
- Draft actionable insights for new head of aviation division to decide which aircraft to purchase

1. Import modules and data set

In [185...]

```
#import pandas
import pandas as pd

#import the data set
av_data = pd.read_csv(r'C:\Users\adamin\Documents\Moringa\phase_one\Phase_one

#View the first five rows to begin understanding the dataset
av_data.head()
```

c:\Users\adamin\anaconda3\envs\learn-env\lib\site-packages\IPython\core\interactiveshell.py:3145: DtypeWarning: Columns (6,7,28) have mixed types. Specify dtype option on import or set low_memory=False.

has_raised = await self.run_ast_nodes(code_ast.body, cell_name,

Out[185...]

	Event.Id	Investigation.Type	Accident.Number	Event.Date	Location	C
0	20001218X45444	Accident	SEA87LA080	1948-10-24	MOOSE CREEK, ID	

1	20001218X45447	Accident	LAX94LA336	1962-07-19	BRIDGEPORT, CA
2	20061025X01555	Accident	NYC07LA005	1974-08-30	Saltville, VA
3	20001218X45448	Accident	LAX96LA321	1977-06-19	EUREKA, CA
4	20041105X01764	Accident	CHI79FA064	1979-08-02	Canton, OH

5 rows × 31 columns



In [185...]

```
#View the last five rows to understand the dataset
av_data.tail()
```

Out[185...]

	Event.Id	Investigation.Type	Accident.Number	Event.Date	Location
90343	20221227106491	Accident	ERA23LA093	2022-12-26	Annapolis, MD
90344	20221227106494	Accident	ERA23LA095	2022-12-26	Hampton, NH
90345	20221227106497	Accident	WPR23LA075	2022-12-26	Payson, AZ
90346	20221227106498	Accident	WPR23LA076	2022-12-26	Morgan, UT
90347	20221230106513	Accident	ERA23LA097	2022-12-29	Athens, GA

5 rows × 31 columns



In [185...]

```
# Explore the dataset columns and row entries
av_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 90348 entries, 0 to 90347
Data columns (total 31 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   Event.Id        88889 non-null   object 
 1   Investigation.Type 90348 non-null   object 
 2   Accident.Number  88889 non-null   object 
 3   Event.Date      88889 non-null   object 
 4   Location         88837 non-null   object 
 5   Country          88663 non-null   object 
 6   Latitude         34382 non-null   object 
 7   Longitude        34373 non-null   object
```

```

8  Airport.Code          50249 non-null object
9  Airport.Name           52790 non-null object
10 Injury.Severity        87889 non-null object
11 Aircraft.damage         85695 non-null object
12 Aircraft.Category       32287 non-null object
13 Registration.Number     87572 non-null object
14 Make                     88826 non-null object
15 Model                    88797 non-null object
16 Amateur.Built            88787 non-null object
17 Number.of.Engines        82805 non-null float64
18 Engine.Type              81812 non-null object
19 FAR.Description           32023 non-null object
20 Schedule                  12582 non-null object
21 Purpose.of.flight          82697 non-null object
22 Air.carrier                16648 non-null object
23 Total.Fatal.Injuries      77488 non-null float64
24 Total.Serious.Injuries     76379 non-null float64
25 Total.Minor.Injuries       76956 non-null float64
26 Total.Uninjured            82977 non-null float64
27 Weather.Condition           84397 non-null object
28 Broad.phase.of.flight        61724 non-null object
29 Report.Status                 82508 non-null object
30 Publication.Date             73659 non-null object
dtypes: float64(5), object(26)
memory usage: 21.4+ MB

```

The data is loaded into a pandas data frame under the variable 'av_data'. Data set has 31 columns with 90348 entries (rows). Numerous columns have missing data with the exception of column 1 (Investigation type) where all the rows in the column have data.

In [185...]

```
#av_data.describe() #for added description of numeric columns
```

In [185...]

```
av_data.columns #Check the description of all the columns
```

Out[185...]

```
Index(['Event.Id', 'Investigation.Type', 'Accident.Number', 'Event.Date',
       'Location', 'Country', 'Latitude', 'Longitude', 'Airport.Code',
       'Airport.Name', 'Injury.Severity', 'Aircraft.damage',
       'Aircraft.Category', 'Registration.Number', 'Make', 'Model',
       'Amateur.Built', 'Number.of.Engines', 'Engine.Type', 'FAR.Description',
       'Schedule', 'Purpose.of.flight', 'Air.carrier', 'Total.Fatal.Injuries',
       'Total.Serious.Injuries', 'Total.Minor.Injuries', 'Total.Uninjured',
       'Weather.Condition', 'Broad.phase.of.flight', 'Report.Status',
       'Publication.Date'],
      dtype='object')
```

2. Data Cleaning

- Check for and remove duplicate rows

As mentioned above, numerous rows have missing data. We begin by cleaning this data to remove duplicates and resolve any missing data.

In [185...]

```
#Find the summation of duplicated rows
print(f"There are {av_data.duplicated().sum()} duplicated rows.")
```

There are 1390 duplicated rows.

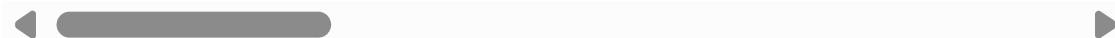
In [185...]

```
av_data[av_data.duplicated()] #View some of the duplicated data
```

Out[185...]

	Event.Id	Investigation.Type	Accident.Number	Event.Date	Location	Country
64050	NaN	25-09-2020	NaN	NaN	NaN	NaN
64052	NaN	25-09-2020	NaN	NaN	NaN	NaN
64388	NaN	25-09-2020	NaN	NaN	NaN	NaN
64541	NaN	25-09-2020	NaN	NaN	NaN	NaN
64552	NaN	25-09-2020	NaN	NaN	NaN	NaN
...
89956	NaN	15-12-2022	NaN	NaN	NaN	NaN
90004	NaN	15-12-2022	NaN	NaN	NaN	NaN
90010	NaN	15-12-2022	NaN	NaN	NaN	NaN
90031	NaN	15-12-2022	NaN	NaN	NaN	NaN
90097	NaN	20-12-2022	NaN	NaN	NaN	NaN

1390 rows × 31 columns



Duplicated data appears to be mostly blank except for the investigation type so these duplicated rows can be safely dropped without affecting data integrity.

In [186...]

```
cleaned_av_data = av_data.drop_duplicates() #Removes the duplicated data ide
```

```
cleaned_av_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 88958 entries, 0 to 90347
Data columns (total 31 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   Event.Id        88889 non-null   object 
 1   Investigation.Type 88958 non-null   object 
 2   Accident.Number  88889 non-null   object 
 3   Event.Date       88889 non-null   object 
 4   Location          88837 non-null   object 
 5   Country           88663 non-null   object 
 6   Latitude          34382 non-null   object 
 7   Longitude         34373 non-null   object 
 8   Airport.Code      50249 non-null   object 
 ..   ...             ...           ...    
```



```

9  Airport.Name          52790 non-null object
10 Injury.Severity      87889 non-null object
11 Aircraft.damage       85695 non-null object
12 Aircraft.Category     32287 non-null object
13 Registration.Number   87572 non-null object
14 Make                  88826 non-null object
15 Model                 88797 non-null object
16 Amateur.Built         88787 non-null object
17 Number.of.Engines     82805 non-null float64
18 Engine.Type           81812 non-null object
19 FAR.Description        32023 non-null object
20 Schedule               12582 non-null object
21 Purpose.of.flight     82697 non-null object
22 Air.carrier            16648 non-null object
23 Total.Fatal.Injuries   77488 non-null float64
24 Total.Serious.Injuries 76379 non-null float64
25 Total.Minor.Injuries   76956 non-null float64
26 Total.Uninjured        82977 non-null float64
27 Weather.Condition      84397 non-null object
28 Broad.phase.of.flight  61724 non-null object
29 Report.Status          82508 non-null object
30 Publication.Date       73659 non-null object
dtypes: float64(5), object(26)
memory usage: 21.7+ MB

```

After cleaning the data, columns remain as 31, rows are 88958 compared to 90348 previously. We then confirmed that there are no remaining duplicated rows.

```
In [186... # Confirm that there are no more duplicated rows.
cleaned_av_data.duplicated().sum()
```

Out[186... 0

b. Clean the 'Make' and 'Model' columns

```
In [186... cleaned_av_data['Make'].unique()
```

Out[186... array(['Stinson', 'Piper', 'Cessna', ..., 'JAMES R DERNOVSEK',
 'ORLICAN S R O', 'ROYSE RALPH L'], dtype=object)

```
In [186... # Check for no. of null or missing values
cleaned_av_data['Make'].isnull().sum()
```

Out[186... 132

As the intention of our analysis is to provide recommendations of a particular make/model of aircraft for the new business endeavour, we need to make sure that our dataset has information on make and model. We can therefore remove rows without a make or model of aircraft.

```
In [186... # Drop rows with missing values in the 'Make' column
cleaned_av_data = cleaned_av_data.dropna(axis=0, subset=['Make'])

# Confirm the 'Make' column has no more missing values
```

```
# Confirm the 'Make' column has no more missing values
cleaned_av_data['Make'].isnull().sum()
```

Out[186... 0

Our audience will also want particular models that are most safe. We will therefore need data that also indicates the model of aircraft as a make may have multiple models. Removing missing model data will enable us to further identify safe models of a particular make.

In [186... cleaned_av_data['Model'].unique()

Out[186... array(['108-3', 'PA24-180', '172M', ..., 'ROTORWAY EXEC 162-F',
'KITFOX S5', 'M-8 EAGLE'], dtype=object)

In [186... #Get the sum of no. of missing values in the 'Model' column
cleaned_av_data['Model'].isnull().sum()

Out[186... 49

In [186... # Drop rows with missing 'Model' data
cleaned_av_data = cleaned_av_data.dropna(axis=0, subset=['Model'])

Confirm the 'Model' column has no more missing values
cleaned_av_data['Model'].isnull().sum()

Out[186... 0

In [186... # Check for next column to clean
cleaned_av_data.columns

Out[186... Index(['Event.Id', 'Investigation.Type', 'Accident.Number', 'Event.Date',
'Location', 'Country', 'Latitude', 'Longitude', 'Airport.Code',
'Airport.Name', 'Injury.Severity', 'Aircraft.damage',
'Aircraft.Category', 'Registration.Number', 'Make', 'Model',
'Amateur.Built', 'Number.of.Engines', 'Engine.Type', 'FAR.Description',
'Schedule', 'Purpose.of.flight', 'Air.carrier', 'Total.Fatal.Injuries',
'Total.Serious.Injuries', 'Total.Minor.Injuries', 'Total.Uninjured',
'Weather.Condition', 'Broad.phase.of.flight', 'Report.Status',
'Publication.Date'],
dtype='object')

Remove unnecessary spacing in the 'Make' and 'Model' column

In [192... #Remove unnecessary spacing and make all to be title case
rel_av_data['Make'] = rel_av_data['Make'].str.strip().str.title()
rel_av_data['Model'] = rel_av_data['Model'].str.strip().str.title()

c. Filter based on purpose of flight

The purpose of the new business endeavour is for commercial and private enterprises.

We can therefore clean then filter the data using the 'Purpose.of.Flight' column to focus on data relevant to the objective of commercial and private venture.

In [187...]

```
# Check for null values in the 'Purpose.of.flight' column
cleaned_av_data['Purpose.of.flight'].isnull().sum()
```

Out[187...]

6138

In [187...]

```
# Drop any null values in the rows
cleaned_av_data = cleaned_av_data.dropna(axis=0, subset=['Purpose.of.flight'])

# Confirm no remaining null values
cleaned_av_data['Purpose.of.flight'].isnull().sum()
```

Out[187...]

0

In [187...]

```
# Check the unique entries in the column
cleaned_av_data['Purpose.of.flight'].unique()
```

Out[187...]

```
array(['Personal', 'Business', 'Instructional', 'Unknown', 'Ferry',
       'Executive/corporate', 'Aerial Observation', 'Aerial Application',
       'Public Aircraft', 'Skydiving', 'Other Work Use', 'Positioning',
       'Flight Test', 'Air Race/show', 'Air Drop',
       'Public Aircraft - Federal', 'Glider Tow',
       'Public Aircraft - Local', 'External Load',
       'Public Aircraft - State', 'Banner Tow', 'Firefighting',
       'Air Race show', 'PUBS', 'ASHO', 'PUBL'], dtype=object)
```

We will filter to include data on flights whose purpose relates to commercial or private endeavours

In [187...]

```
# Get entries that have the relevant flight purposes
cleaned_av_data = cleaned_av_data[cleaned_av_data['Purpose.of.flight'].isin([
```



In [187...]

```
# Confirm that the relevant purpose of flight data is included
cleaned_av_data['Purpose.of.flight'].unique()
```

Out[187...]

```
array(['Business', 'Ferry', 'Executive/corporate', 'Positioning'],
      dtype=object)
```

In [187...]

```
cleaned_av_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 7026 entries, 8 to 90327
Data columns (total 31 columns):
 #   Column           Non-Null Count  Dtype  
 ---  -- 
 0   Event.Id        7026 non-null   object 
 1   Transaction Type 7026 non-null   object 

```

```

+-----+-----+-----+
2 Accident.Number      7026 non-null  object
3 Event.Date           7026 non-null  object
4 Location              7020 non-null  object
5 Country               6987 non-null  object
6 Latitude              2046 non-null  object
7 Longitude             2047 non-null  object
8 Airport.Code          3740 non-null  object
9 Airport.Name          3972 non-null  object
10 Injury.Severity     7022 non-null  object
11 Aircraft.damage      6856 non-null  object
12 Aircraft.Category    1865 non-null  object
13 Registration.Number  6930 non-null  object
14 Make                  7026 non-null  object
15 Model                 7026 non-null  object
16 Amateur.Built        7020 non-null  object
17 Number.of.Engines    6746 non-null  float64
18 Engine.Type          6748 non-null  object
19 FAR.Description       1875 non-null  object
20 Schedule              207 non-null   object
21 Purpose.of.flight    7026 non-null  object
22 Air.carrier           901 non-null   object
23 Total.Fatal.Injuries 6266 non-null  float64
24 Total.Serious.Injuries 6097 non-null  float64
25 Total.Minor.Injuries 6128 non-null  float64
26 Total.Uninjured       6579 non-null  float64
27 Weather.Condition     6925 non-null  object
28 Broad.phase.of.flight 5639 non-null  object
29 Report.Status         6803 non-null  object
30 Publication.Date     5488 non-null  object

```

dtypes: float64(5), object(26)

memory usage: 1.7+ MB

d. Filter to retain data collected in the last 20 years

We'd like to filter the data to focus on data covering the last 20 years so that it can apply to aircraft that are still relatively available in the market, with current aviation equipment and which have a significant enough period of operation left even after purchase for this business endeavour.

In [187...]

```

# Check that 'Event.Date' column data is in the correct format
cleaned_av_data['Event.Date'] = pd.to_datetime(cleaned_av_data['Event.Date'])

#Filter for data from 2005
cleaned_av_data = cleaned_av_data[cleaned_av_data['Event.Date'] >= '2005-01-01']

```

In [187...]

```
cleaned_av_data.info()
```

```

<class 'pandas.core.frame.DataFrame'>
Int64Index: 1611 entries, 58024 to 90327
Data columns (total 31 columns):
 #   Column           Non-Null Count Dtype
 ---  -----
 0   Event.Id         1611 non-null  object
 1   Investigation.Type 1611 non-null  object
 2   Accident.Number  1611 non-null  object

```

```

3   Event.Date           1611 non-null  datetime64[ns]
4   Location             1611 non-null  object
5   Country              1611 non-null  object
6   Latitude              1538 non-null  object
7   Longitude             1539 non-null  object
8   Airport.Code          1010 non-null  object
9   Airport.Name          1020 non-null  object
10  Injury.Severity      1607 non-null  object
11  Aircraft.damage      1550 non-null  object
12  Aircraft.Category    1344 non-null  object
13  Registration.Number  1579 non-null  object
14  Make                  1611 non-null  object
15  Model                 1611 non-null  object
16  Amateur.Built         1606 non-null  object
17  Number.of.Engines     1483 non-null  float64
18  Engine.Type           1387 non-null  object
19  FAR.Description       1354 non-null  object
20  Schedule               94 non-null   object
21  Purpose.of.flight     1611 non-null  object
22  Air.carrier            901 non-null  object
23  Total.Fatal.Injuries   1312 non-null  float64
24  Total.Serious.Injuries 1252 non-null  float64
25  Total.Minor.Injuries   1255 non-null  float64
26  Total.Uninjured        1460 non-null  float64
27  Weather.Condition      1525 non-null  object
28  Broad.phase.of.flight  377 non-null   object
29  Report.Status          1388 non-null  object
30  Publication.Date       1525 non-null  object
dtypes: datetime64[ns](1), float64(5), object(25)
memory usage: 402.8+ KB

```

... Further data exploration...

```
In [187...]: #Further Data Exploration of Investigation.Type column
cleaned_av_data['Investigation.Type'].unique()
```

```
Out[187...]: array(['Accident', 'Incident'], dtype=object)
```

```
In [187...]: cleaned_av_data['Investigation.Type'].value_counts()
```

```
Out[187...]: Accident    1519
Incident      92
Name: Investigation.Type, dtype: int64
```

```
In [188...]: #Further data exploration of the Aircraft.Category column
cleaned_av_data['Aircraft.Category'].unique()
```

```
Out[188...]: array([nan, 'Helicopter', 'Airplane', 'Balloon', 'Gyrocraft', 'Glider'],
                   dtype=object)
```

```
In [188...]: cleaned_av_data['Aircraft.Category'].value_counts()
```

```
Out[188...]: Airplane     1032
Helicopter    282
Balloon       26
..
```

```
Glider      3  
Gyrocraft   1  
Name: Aircraft.Category, dtype: int64
```

```
In [188...     cleaned_av_data['Aircraft.Category'].value_counts().sum()
```

```
Out[188...    1344
```

```
In [188...     cleaned_av_data['Aircraft.Category'].isnull().sum()
```

```
Out[188...    267
```

```
In [188...     cleaned_av_data['Report.Status'].unique()
```

```
Out[188... array(['Probable Cause', 'Foreign',  
        "The pilot's inadequate compensation for wind conditions. A factor in  
        the accident was the wind gust.",  
        'A total loss of engine power due to the fatigue failure of a third st  
        age turbine wheel blade.',  
        "The pilot's delayed decision to perform a precautionary landing. Con  
        tributing to the accident was the reduced visibility in snow and the soft ter  
        rain.",  
        "A partial loss of engine power for an undetermined reason. Contributi  
        ng to the accident were the pilot's inadvertent encounter with IMC condition  
        s, and a whiteout during his attempted go-around from an emergency landing ap  
        proach.",  
        "The pilot's loss of control on landing. A factor was a gusting cross  
        wind component.",  
        'The pilot experienced spatial disorientation during the initial climb  
        causing him to lose control of the airplane.',  
        'Loss of engine power during the takeoff initial climb due to lack of  
        compression to a cylinder.',  
        "The depletion of pressure in the normal hydraulic system for an undet  
        ermined reason, and the pilots' failure to properly operate the emergency bra  
        king system. Contributing to the accident was an inoperative hydraulic system  
        aural warning.",  
        "The pilot's failure to maintain directional control of the airplane d  
        uring an aborted takeoff.",  
        "The pilot's failure to maintain aircraft control resulting in the hel  
        icopter impacting the water. Factors contributing to the accident were the p  
        ilot's inadvertent flight into instrument meteorological conditions, the low  
        ceiling, dark night conditions, and the pilot's lack of recent instrument fly  
        ing experience.",  
        "The pilot's failure to maintain control of the airplane during the la  
        nding flare/touchdown.",  
        'The collapse of the landing gear during landing rollout for undetermi  
        ned reasons.',  
        "The reported loss of both engines' power during cruise for undetermin  
        ed reasons.",  
        'The loss of pitch control during cruise flight resulting from the sep  
        aration of the stabilator trim actuator due to inadequate maintenenace.',  
        "The airplane's runway excursion during landing roll following an enco  
        unter with ice. Contributing to the accident was the ice-covered runway, and  
        the airport personnel's lack of knowledge regarding the runway condition.",  
        "The pilot's decision to fly into an area of forecast weather suitable  
        for structural icing. Contributing to the accident was the effect of the str  
        uctural icing encountered."]
```

"The captain's inadequate compensation for wind conditions during the landing flare/touchdown. Contributing to the accident were a crosswind and windshear.",

"The flight crew's failure to execute a missed approach, which resulted in a runway excursion after landing. Contributing to the accident were the inoperative lights, weather conditions below published approach minimums, and the slush contaminated runway.",

"The pilot's failure to maintain the proper approach course for undetermined reasons.",

"The flight crew's failure to reset the brakes circuit breaker resulting in a loss of brakes during taxi and an on ground collision with an unoccupied parked airplane.",

'A loss of engine power for undetermined reasons.',

"The pilot's improper flare.",

'A loss of engine power as a result of a blocked carburetor. A factor was the lack of suitable terrain for the forced landing.',

nan,

"The pilot's misjudged speed and altitude during approach that led to a long landing and his subsequent failure to maintain control during an attempted go-around. Contributing to the accident were the dark night, the pilot's low total night flight experience, and low total time in the make and model airplane.",

"The co-pilot's failure to maintain directional control during the landing roll. Contributing to the accident was a loss of system A hydraulic fluid for undetermined reasons and the flight crew's failure to follow the checklist sequence.",

"The pilot's encounter with severe turbulence during descent into the airport environment, which resulted in an exceedence of the aircraft's design stress limit and structural damage.",

"The flightcrew's misjudged flare while landing. \r\n\r",

"Fatigue failure and separation of the propeller during cruise flight. Contributing to the accident was the owner's failure to comply with a long standing Airworthiness Directive.",

'the impact with a bird during initial takeoff climb.',

'An uncommanded landing gear retraction after touchdown for undetermined reasons.',

'A loss of control during the landing roll due to a failure or malfunction of the brake system, resulting in a loss of control, and structural damage to the airplane.',

"The pilot's failure to maintain an adequate airspeed during climb out resulting in an aerodynamic stall/spin.",

"The pilot's failure to maintain directional control after encountering an unknown object on the dirt runway.",

'The flying pilot\x92s failure to maintain directional control while landing in a crosswind. A factor contributing to the accident was a crosswind.',

"The pilot's failure to maintain rotor RPM while maneuvering at a low altitude, which resulted in a loss of control.",

'The pilot\x92s failure to maintain clearance from trees along the top of a ridgeline due to inadequate preflight planning, insufficient altitude, and the lack of a helicopter terrain awareness and warning system. \r\n\r\nMember Sumwalt did not approve this brief and probable cause. Member Sumwalt filed a dissenting statement that can be found in the public docket for this accident.',

"The pilot's inadvertent activation of the main landing gear brakes during the recovery from a bounced landing.",

'The pilot inadvertently raised the landing gear during landing roll.',

'The failure of the starflex arm during engine run-up due to inadequate inspection by maintenance personnel.',

"The loss of engine power due to the pilot's failure to use the carburetor heat during the flight. Contributing factors included the carburetor icing conditions and the trees.",

'The pilot\x92s failure to ensure that both engine switches were in the FLIGHT position for takeoff.',

'The malfunction and premature retraction of the landing gear for undetermined reasons.',

"The airplane manufacturer's inadequate software design requirements of the engine's full authority digital electronic controls (FADEC) fault logic that resulted in a simultaneous unrecoverable loss of thrust control on both engines when the FADEC's input data values exceeded specified ranges during the approach. Contributing to the incident was the Federal Aviation Administration's failure to recognize and correct this condition during the certification of the airplane.",

'An outboard left wing explosion during takeoff due to the improper fuel cell installation and inadequate subsequent inspections by maintenance personnel.',

'A total loss of engine power due to the fatigue failure of the Number 3 cylinder connecting rod.',

"The pilot's selection of an unsuitable takeoff/landing area.",

'A total loss of engine power for undetermined reasons.',

'The improper installation of spark plugs during the annual inspection which resulted in a loss of engine power shortly after takeoff. Contributing to the accident was the lack of suitable terrain during the forced landing.',

"The pilot's improper loading of personal belongings which resulted in rudder pedal interference.",

"The pilot's failure to maintain aircraft control. Contributing to the accident was the pilot's failure to maintain adequate airspeed.",

"The pilot's spatial disorientation resulting in his failure to detect and compensate for an unintentional descent during a go-around. Contributing to the accident were the pilot's inadequate choice of landing approach, reduced visibility from brownout conditions, and the dark night.",

"The pilot's failure to maintain control of the airplane during the landing touchdown, resulting in the wings contacting the runway surface and a propeller strike.",

"The failure of company maintenance personnel to ensure the helicopter was properly maintained, resulting in a severe in-flight vibration due to collective bounce. Contributing to the accident was loose and worn bearings on the helicopter's stabilizer bar, swashplate, flight control tube assemblies, and the right and left hydraulic servos.",

'The loss of engine power for undetermined reasons. Contributing to the accident was the unsuitable terrain for the forced landing.',

"The pilot's selection of unsuitable terrain for takeoff.",

'The lack of available engine power and subsequent loss of rotor rpm due to the pilot\x92s departing with one engine at idle. Contributing to the incident was a corroded engine control wiring harness.',

'The improper installation of the forward edge of the left-hand wing-top-body panel, causing the fairing to separate from the airplane during an in-flight encounter with light turbulence. Contributing to the event was the use of small-head screws and grommets in securing the fairing.',

"The pilot\x92s failure to maintain an adequate airspeed while maneuvering for landing, which resulted in an aerodynamic stall and subsequent loss of control. Contributing to the accident was the pilot's impairment from recent marijuana use.",

"The LC-10 controller's failure to ensure the appropriate separation between two airplanes operating on runways where flight paths intersect.",

"The pilot's inability to maintain directional control due to the fatigue failure of the threaded portion of the forward directional control cable as a result of the improper installation a lock washer.",

'The unsuitable terrain encountered by the pilot during a forced landing following a loss of engine power due to a cylinder head separation. Conti

'...ing following a loss of engine power due to a cylinder head separation. Contributing to the accident was the tree.' ,

"The flight team's failure to program the UAS with flight-tested parameters that could tolerate the high density altitude and tailwind conditions encountered during the flight, which resulted in two undershoot approaches, and the existence of an undiscovered software anomaly that resulted in a momentary loss of control and overshoot of the final approach course, followed by a steep descent and subsequent collision with a light pole." ,

"The pilot's failure to maintain directional control during an aborted landing." ,

'The air traffic controller\x92s failure to properly monitor the runway environment. Contributing to the accident was the tractor operator\x92s failure to scan the active runway prior to crossing, and the Federal Aviation Administration\x92s inadequate emphasis on vehicle operator visual vigilance when crossing active runways with air traffic control clearance.' ,

'Restriction of the elevator controls due to the presence of the seat belt buckled around the co-pilot control stick. An additional cause was the failure of the pilot to verify that the flight controls were unobstructed before flight. Contributing factors were the wet grass encountered during the runway excursion, and the sign and light impacted during the event.' ,

"The pilot's failure to maintain sufficient airspeed during the base to final turn resulting in an aerodynamic stall." ,

'The impact with a bird during initial takeoff climb.' ,

"The pilot's delayed decision to abort the takeoff. Contributing to the accident was the pilot's attempted takeoff with a propeller start lock inadvertently engaged." ,

'The pilot\x92s failure to maintain terrain clearance during takeoff for undetermined reasons.' ,

"The pilot's failure to maintain clearance from obstacles while taxiing." ,

"The pilot's failure to see a wire cable prior to colliding with it. Factors contributing to the accident were the non-routine positioning of the wire cable, and the ground crew's failure to advise the pilot that the wire had been re-routed." ,

'On August 26, 2008, about 1100 local time, a Cessna 172, Ecuadorian registration HC-BKY, registered to an operated by Wings of Hope Incorporated, as a medical transport flight, crashed following a loss of engine power, while in cruise flight to Rio Amazonas Airport, Pastaza, Ecuador. Visual meteorological conditions prevailed, and no flight plan was filed. The airplane was substantial damage. The private-rated pilot and passenger received serious injuries. \r\n\r\nAccording to information obtained from the Ecuadorian Subdireccion de Aviacion Civil, the pilot reported total loss of engine power, while in cruise flight. He conducted an emergency landing, and crashed into tree s.\r\n\r\nThis investigation is under the jurisdiction of the Government of Ecuador. Any further information can be obtained from:\r\n\r\n\r\nDireccion General de Aviacion Civil\r\nBuenos Aires 149 Y 10 de Agosto\r\nP.O. Box 2077\r\nQuito, Republica del Ecuador\r\n\r\n\r\nPhone: 593-2-223-8981\r\nFax: 593-2- 223-8352\r\n\r\n\r\nThis information is for informational purposes only, and contains information released by, or obtained for the Government of Ecuador. \r\n\r\n',

'An in-flight loss of control for undetermined reasons.' , '.' ,

"The in-flight separation of a main rotor blade due to a fatigue failure of the blade spar, rendering the helicopter uncontrollable, and the manufacturer's production of main rotor blades with latent manufacturing defects, which precipitated the fatigue failure of the blade spar." ,

'Failure of the door to remain secure for undetermined reasons.' ,

"The pilot's failure to maintain control during landing. A factor was the reported wind shear." ,

'A loss of engine power while maneuvering due to the disintegration of the number two main bearing, which resulted in a fracture of the crankshaft. Contributing to the accident was inadequate maintenance.' ,

'A loss of engine power due to fuel exhaustion as a result of siphoning

g from the fuel filler neck and cap. Contributing to the incident were the fuel over-servicing which resulted in the siphoning condition, and the ASTM standards which allowed for the fuel tank filler neck/vent design.',

'A loss of aircraft control due to spatial disorientation.',

"The pilot's improper flare which resulted in a hard landing. Contributing to the accident was the pilot's lack of experience in the accident airplane make and model.",

"Improper maintenance on the tail wheel anti-shimmy mechanism and the pilot's decision to continue operating the airplane with a known shimmy in the tail wheel.",

"The pilot's failure to maintain tail rotor clearance from the safety netting during final approach and landing.",

'The fatigue failure of a blade in the second-stage turbine wheel, which resulted in a total loss of engine power.',

'The in-flight collision with a bird.',

'The failure of the vertical stabilizer control adapter due to reverse bending fatigue.',

"The pilot's inadequate in-flight fuel planning, resulting in loss of engine power due to fuel exhaustion.",

'The failure of the flightcrew to stabilize the helicopter over its confined landing area during a hovering left-pedal turn, resulting in tail rotor blade contact with a perimeter fence component and a subsequent loss of directional control. Contributing to the accident was the inadequate markings of the heliport and heliport spots, and failure of FAA personnel to detect the inadequate heliport markings during inspection of the heliport approximately 1 month prior to the accident.',

'The pilot\x92s failure to maintain adequate airspeed during initial climb, resulting in a stall and collision with terrain. Contributing to the accident was the pilot\x92s lack of recent experience.',

'The failure of the hydraulic landing gear extension systems due to a ruptured line.',

"The pilot's failure to maintain lateral aircraft control that resulted in collision with terrain during landing.",

"The pilot's failure to maintain clearance from rising terrain. Contributing to the accident was the pilot's continued flight into deteriorating weather conditions.",

'Failure of the ground service vehicle driver to maintain adequate clearance/distance from the taxiing airplane.',

'The failure of the propeller shaft seal in flight. Contributing to the accident was the lack of suitable terrain for a forced landing.',

'The mechanical overload of the nosewheel steering links for undetermined reasons, which resulted in nose landing gear rotation and its subsequent wedging within the wheel well structure.',

"The pilot's failure to maintain directional control while landing in gusting winds.",

'A partial loss of engine power due to a failure of the number one cylinder exhaust valve, and the associated secondary damage to the intake valve and piston.',

"The pilot's failure to feather the left propeller and secure the left engine following the total loss of left engine power, and his subsequent failure to maintain airspeed, lateral, and directional control of the airplane. Contributing to the accident was the failure of maintenance personnel to properly tighten the fuel supply hose at the engine-driven fuel pump.",

'None.',

'The loss of engine power due to fuel starvation as a result of a loose fuel filter upper drain cap, which was not properly secured by maintenance personnel.',

"The pilot's failure to maintain clearance from a power line due to the lack of forward visibility because of an ice-covered windshield. Contributing to the accident was the flight's encounter with icing weather condition

s.",

'The pilot\x92s improper configuration of the airplane following an engine shutdown, which resulted in a low-altitude, unstabilized approach. Contributing to the accident was a loss of engine power for undetermined reasons.',

"The pilot's failure to properly configure the pressurization controls, resulting in his impairment and subsequent incapacitation due to hypoxia.",

"The pilot's excessive airspeed and improper flare while landing in gusting winds.",

'the failure of the maintenance personnel to properly complete the installation, and the inspection personnel to conduct the proper functional test, of the left main landing gear uplock assembly.',

"The helicopter's encounter with a gusty crosswind condition during engine start that exceeded the helicopter's demonstrated wind envelope.",

"Maintenance personnel's failure to reinstall the left front pilot's seat correctly, which resulted in the pilot's loss of control and subsequent impact with a taxiway sign.",

'An interruption of fuel flow for undetermined reasons, which resulted in an engine flameout.',

"The pilot's loss of directional control during landing on an ice-contaminated runway.",

"The pilot's failure to complete the before-landing checklist, which led to his failure to lower the gear before landing.",

"The failure of the right propeller to go to the feathered position for undetermined reasons following a total loss of right engine power during initial climb due to fuel starvation as a result of the pilot's improper fuel planning.",

"The separation of the endplate bolts for undetermined reasons, resulting in an in-flight separation of the right endplate. Contributing to the accident was the manufacturer's failure to provide sufficient guidance for endplate bolt installation.",

"The pilot's improper preflight weather planning and his continued VFR flight into IMC conditions resulting in an in-flight collision with trees.",

'The failure of both pilots to positively identify the runway prior to landing.',

"The pilot's failure to maintain directional control during landing. Contributing to the accident was the pilot's improper application of brakes.",

'The pilot\x92s failure to maintain aircraft control during the approach resulting in an aerodynamic stall and subsequent impact with terrain. Contributing to the accident was the pilot\x92s improper preflight planning and conditions conducive for structural icing.\r\n\r\n',

"The pilot's loss of situational awareness and failure to maintain clearance from hilly terrain while flying in an area of a low cloud ceiling. Contributing to the accident was the pilot's decision to continue flight due to a self-induced pressure.",

'This is under the jurisdiction and control of the Swiss government.',

'The investigation is under the jurisdiction of the government of Panama. Further information pertaining to this accident may be obtained from:\r\n\r\n\r\nDireccion de Aeronautica Civil \r\n\r\nApartados 7501 y 7615 \r\n\r\nPanama 5\r\n\r\nhttp://www.aeronautica.gob.pa\r\n\r\n\r\nThis report is for information purposes only and contains only information released by the Panamanian Government.',

"The pilot's misjudged landing flare. Contributing to the accident was the brownout condition created by the dust cloud that interfered with the pilot's perception of proximity to the ground, and the glare interference from the parked fire vehicles headlights with the pilot's night vision goggles.",

"The pilot's improper flare and recovery from a bounced landing.",

"The failure of the tail rotor driveshaft and coupling during engine start due to the mechanic's failure to properly reattach the tail rotor driveshaft and coupling during maintenance.",

'Inflight collision with terrain for undetermined reasons '

"The pilot's misjudged speed and altitude, which resulted in an undershoot of the landing zone.",

"The pilot's improper flare, which resulted in a hard landing.",

'The separation of the left engine cowling for undetermined reasons.',

"The loss of engine power during cruise flight due to fuel contamination. Also causal was the pilot's decision to conduct the flight with known contaminants in the fuel.",

"The flight crew's failure to follow the manufacturer\x92s aircraft flight manual emergency procedures following a rejected takeoff that required a high energy stop inspection. Contributing to the accident was the flight's exceedence of the aircraft's maximum brake energy weight.",

"The pilot's failure to maintain clearance from the parked helicopter.",

"The pilot's failure to maintain adequate main rotor rpm while maneuvering at a low altitude.",

"A loss of engine power due to carburetor icing as a result of the pilot's failure to use carburetor heat.",

"The pilot's failure to achieve the proper touchdown point during a full-stop landing attempt. Contributing to the accident were the pilot's failure to ensure that the aircraft was properly configured for landing, his not initiating a go-around, and a malfunction in one of the main landing gear braking systems.",

'The uncommanded retraction of the right main landing gear hydraulic actuator strut for undetermined reasons.',

'The formation and propagation of a fatigue crack in the trailing edge of the main rotor blade due to interconnected porosity and resultant corrosion. The area of interconnected porosity was due to a manufacturing defect which was not detected during the manufacturing process.',

'A loss of engine power due to the failure of the number one engine cylinder for undetermined reasons.',

"The pilot's failure to maintain clearance from snow-covered terrain during the landing approach in flat light conditions.",

'The pilot\x92s failure to maintain aircraft control during taxi, which resulted in a dynamic rollover.',

"The pilot's incorrect use of pitch control, resulting in induced pitch oscillations and loss of aircraft control. Contributing to the accident were the pilot's total lack of experience in aircraft make/model, and his lack of recency of experience.",

'A loss of engine power due to the failure of one or more compressor turbine blades for an undetermined reason.',

"The flight crew's failure to maintain terrain clearance during low altitude flight in low ceiling and visibility conditions. Contributing to the accident was the flight crew's failure to adequately monitor their location with respect to the rising terrain environment ahead, and, their lack of crew resource management communication as a crew.",

'The pilot\x92s failure to maintain control of the airplane while operating in instrument meteorological conditions due to spatial disorientation. Contributing to the accident was the pilot\x92s inattention to basic aircraft control while attempting to program the autopilot system.',

"The pilot's failure to maintain adequate airspeed in a turn while attempting to return to land, which resulted in an aerodynamic stall. Contributing to the accident was the reported loss of engine power for undetermined reasons.",

"The pilot's failure to maintain clearance from the windsock during the approach.",

'The loss of engine power due to disengagement of the magneto idler gear support pin.',

"The pilot's failure to maintain control of the helicopter during take off for undetermined reasons.",

'The failure of maintenance personnel to properly maintain the cargo d

oor latch, resulting in an in-flight opening and separation of the cargo doo r, and substantial damage to the horizontal stabilator when it was struck by remnants of the cargo door.',

"The pilot's failure to maintain directional control while landing wit h a crosswind.",

"A total loss of engine power due to fuel exhaustion as a result of th e pilot's inadequate preflight fuel planning.",

"An in-flight collision with a large bird during the airplane's initia l climb.",

"The flight crew's misjudgment of speed and distance, which resulted i n an overrun of the wet runway.",

"The pilot's failure to maintain directional control during landing.",

'The pilot\x92s failure to maintain aircraft control following a loss of engine power due to contamination in the carburetor. Contributing the seve rity of the accident was the pilot\x92s failure to utilize his shoulder harne ss.',

"The pilot's failure to lower the landing gear prior to landing. Contr ibuting to the accident were the distractions created by the pilot incorrectl y setting a radio frequency and by his fixation on an airplane that was on th e runway during his approach.",

'A partial loss of engine power due to propeller damage from being str uck by the cabin-entry door, which inadvertently opened and departed the airf rame for undetermined reasons during flight.',

'The pilot\x92s failure to establish and maintain a stabilized final a pproach which resulted in a hard landing and runway overrun.',

"A loss of engine power due to fuel exhaustion as a result of the pilo t's failure to properly verify the fuel load prior to departure.",

'The failure of the landing gear accumulator seal for undetermined rea sons. Contributing to the accident was the pilot\x92s failure to confirm the status of the landing gear.',

"The crew's failure to see and avoid a steel pole during a nighttime a pproach to the helipad.",

'A malfunction of the landing gear selector switch and a loose fitting on the emergency extension system which rendered the landing gear system inop erable.',

'The pilot\x92s decision to operate into a known area of adverse weath er, which resulted in the inadvertent penetration of a severe thunderstorm, a subsequent loss of control, and in-flight breakup of the airplane.',

'The pilot failure to maintain proper speed and distance during approa ch to land which resulted in landing long and subsequent runway excursion.',

'Flight into terrain for undetermined reasons.',

'the loss of engine power for undetermined reasons.',

'The cabin entry door inadvertently opening during initial climb.',

'The pilot\x92s improper decision to depart on a visual flight rules (VFR) flight at night in adverse weather conditions in close proximity to ris ing mountainous terrain in a helicopter that was only certified to be operate d under VFR and his subsequent failure to maintain adequate clearance with wi res.',

'A hard landing on an unknown date, resulting in damage to the left ma in landing gear support fitting.',

'The pilot\x92s lack of experience flying the accident make and model of airplane, which led to a loss of control while maneuvering to return to th e airport. Contributing to the accident was a partial loss of engine power fo r undetermined reasons.',

"The in-flight loss of control due to the pilot's impairment as a resu lt of hypoxia. Contributing to the accident was the pilot's decision to opera te the unpressurized airplane at an altitude requiring supplemental oxygen wi thout having any oxygen available.",

"The pilot's failure to arrest the helicopter's descent, which resulte d in controlled flight into terrain.",

'The complete loss of thrust due to the second-in-command\x92s (SIC) inadvertent feathering of both propellers during a high-speed, low-altitude approach. Contributing to the accident was the pilot-in-command\x92s inadequate monitoring of the SIC\x92s performance.\r\n\r\nChairman Hersman and Member Rosekind did not approve this probable cause. Chairman Hersman filed a dissenting statement, which Member Rosekind joined. Member Rosekind filed a dissenting statement, which Chairman Hersman joined. Member Sumwalt filed a concurring statement, which Vice Chairman Hart and Member Weener joined. The statements can be found in the public docket for this accident.',

"The pilot's failure to disconnect the ground power unit prior to take off.",

"The pilot's failure to maintain clearance from a boulder during a low-altitude takeoff turn.",

"The pilot's failure to maintain directional control during landing and his failure to execute a go-around.",

'The improper installation of the pitch trim cable which resulted in it making improper contact with a guard pin that led to the fatigue failure of the cable.',

"A total loss of engine power due to fuel exhaustion as a result of the pilot's inadequate in-flight planning and his decision to continue flight with a known low fuel level state.",

"The pilot's decision to attempt a landing in weather conducive to strong downdrafts, resulting in a loss of control.",

'The failure of the landing gear accumulator/regulator and the installation of the improper priority valve, which precluded the landing gear from extending and locking into place.',

'A total loss of left engine power and subsequent failure of the airplane to maintain airspeed and altitude on the remaining engine for undetermined reasons.',

'The pilot became spatially disoriented while maneuvering on a dark night, which resulted in a loss of helicopter control.',

"The Travel Air pilot's failure to maintain an adequate visual lookout during taxi.",

'A loss of aircraft control for undetermined reasons.',

'Under the jurisdiction and control of the German government.',

"The pilot's decision to continue the approach below minimums without visual references, and subsequent collision with the perimeter fence/terrain.",

"The pilot's inadequate preflight inspection and the momentary loss of engine power due to snow or ice ingestion.",

"The pilot's improper decision to attempt a transoceanic flight in turbulent, icing conditions, with an overweight airplane that was not approved for moderate turbulence and not equipped with deicing systems. Contributing to the accident was the pilot's personal pressure to return home.",

'A loss of control for undetermined reasons.',

"The pilot's loss of aircraft control after encountering turbulence over a mountain range. Contributing to the accident was the pilot's failure to obtain an Airmet for turbulence along the route of flight prior to departure and while enroute.",

'The flight crew\x92s improper preflight inspection and failure to remove the main landing gear wheel chock, resulting in damage and subsequent failure of the main landing gear tire during the takeoff roll.',

"The pilot's failure to maintain directional control during landing, and his failure to properly execute a go-around.",

"The improper installation of the engine-to-main gear box flex coupling, which resulted in the failure of the flex coupling and a loss of power to the rotor system during takeoff. Contributing to the accident was the mechanic who removed the engine's failure to follow the operator\x92s maintenance procedures. Also contributing was the Quality Assurance inspector's failure to follow the operator\x92s post-maintenance inspection requirements.",

'The failure of maintenance personnel to properly secure one tail rotor

r pitch change link to its respective tail rotor blade resulting in an in-flight separation of the link from the blade. Contributing to the accident was the lack of an adequate post-maintenance inspection procedure.',

"The flight crew's decision to attempt a flight that was below takeoff, landing, and alternate airport weather minimums, which led to a touchdown off the runway surface by the pilot-in-command.",

"The pilot's spatial disorientation and subsequent failure to maintain airplane control.",

"A partial loss of engine power during takeoff due to a bird's nest being sucked into the induction air ducting.",

"An in-flight fire due to a fuel leak from the No. 5 cylinder's broken fuel injector/line.",

'A loss of engine power during cruise flight due to the fatigue failure of the pneumatic fuel-to-governor control line. Also causal was the inadequate installation of the pneumatic line by maintenance personnel, and the pilot's decision to continue flight with a known discrepancy.',

"The pilot's failure to maintain airplane control during final approach.",

'The airplane's encounter with localized severe to extreme mountain wave turbulence which resulted in substantial damage to both wings.',

'This investigation is under the jurisdiction and control of the German Government.',

'The pilot's failure to detect water contaminated fuel, which resulted in a loss of engine power shortly after takeoff. Contributing to the accident were the worn and loose fuel caps, which allowed water to enter the fuel tanks.',

'The pilot's failure to maintain aircraft control while performing a go-around.',

"The pilot's failure to properly configure the landing gear for landing. Contributing to the accident was the pilot's diverted attention looking for traffic and manipulating the secondary trim controls.",

"The pilot's failure to see and avoid an unlit and unmarked helicopter dolly while taxiing at night.",

'This investigation is under the jurisdiction and control of the Honduran government.',

"A loss of engine power due to fuel starvation as a result of the pilot's improper fuel management.",

'The failure of maintenance personnel to properly secure a fitting cap on the throttle and metering assembly inlet after conducting a fuel system pressure check, which resulted in a loss of engine power due to fuel starvation. Contributing to the accident was the decision by the Director of Maintenance to return the airplane to service without verifying with the assigned inspector that all annual inspection items had been completed.',

'A partial loss of engine power during the initial climb for undetermined reasons.',

"The pilot's failure to maintain directional control during the landing roll in gusting winds. Contributing to the accident was a loss of engine power on final approach due to fuel exhaustion as a result of the pilot having to divert due to deteriorating weather conditions.",

"The pilot's decision to attempt the flight into approaching adverse weather, resulting in an encounter with a thunderstorm with localized instrument meteorological conditions, heavy rain, and severe turbulence that led to a loss of control.",

'A fire of undetermined origin.',

"The pilot's failure to maintain directional control during landing roll for undetermined reasons, resulting in a runway excursion.",

"The pilot's failure to maintain aircraft control during landing, which resulted in an encounter with wet/muddy terrain and a subsequent nose over.",

"The pilot's inadequate preflight inspection to ensure that all tie-do

wn straps were removed prior to flight. Contributing to the accident was the pilot's improper management of sleep opportunities during the preceding rest period, which likely contributed to the development of fatigue.",

"The inadequate design of the engine mount by the manufacturer, resulting in collapse of the nose landing gear. Contributing to the accident was the failure of the operator to adhere to the manufacturer's suggested engine mount inspection schedule.",

"The pilot's failure to maintain airspeed while maneuvering after take off, which resulted in an aerodynamic stall, loss of aircraft control, and collision with trees.",

"The corrosion of the left landing gear rotor and brake, which resulted in the loss of directional control during the landing rollout, and the pilot's inadequate preflight inspection.",

'A loss of engine power for undetermined reasons. ',

"The airplane's inadvertent collision with deer during a night takeoff. Contributing to the accident was the lack of a deer barrier between the airport and an adjacent wooded area.",

"The uncertificated pilot's selection of an unsuitable landing site, resulting in a main landing gear collapse during the landing roll.",

'An in-flight collisions with two Cackling Geese (Branta Hutchinsi i).',

"The pilot's failure to maintain clearance from snow-covered terrain while hovering in flat light conditions, which resulted in a dynamic rollover.",

'Failure of both pilots to ensure that the airplane was properly configured for landing.',

'A worn wire in the magneto system, which allowed intermittent grounding and a loss of engine power.',

"The pilot\x92s decision to load the airplane well beyond its allowable weight and center of gravity limits, resulting in a loss of control during the initial climb. Contributing to the severity of the injuries was the pilot \x92s decision to allow two child passengers to sit on other passenger's laps without restraints, and his failure to properly secure the cargo in the cabin. Also contributing was the pilot's excessive extension of the wing flaps.",

'The pilot\x92s failure to establish proper rotation and liftoff speed during the takeoff roll.',

'The pre-existent damage of the right-hand landing gear actuator attachment lug which led to fatigue cracking and eventual overload failure resulting in a collapsed gear upon landing.',

'The pilot\x92s decision to land on a water contaminated runway, which resulted in a runway excursion during the landing roll. Contributing to the accident was the pilot\x92s lack of knowledge regarding the landing distance required and the limited braking effectiveness on a water contaminated runway.',

'The pilot\x92s loss of control for undetermined reasons.',

'The failure of maintenance personnel to ensure that a hydraulic line fitting was adequately secured during a conditional inspection, which resulted in a leak and subsequent on-ground fire.',

"The pilot's failure to maintain directional control of the airplane after encountering a gust of wind while taking off with a crosswind.",

'The pilot\x92s inadequate preflight fuel planning and management in-flight, which resulted in total loss of engine power due to fuel exhaustion. Contributing to the accident was the pilot\x92s use of performance-impairing medications.',

"The pilot's loss of directional control while attempting to move the helicopter laterally without first lifting it fully off its landing platform.",

"The pilot's inadequate compensation for a wind gust during the landing roll.",

"The pilot's failure to retrim the airplane and maintain aircraft control during an inadvertent roll during a low-level maneuver.",

for during an uncrewed training, which resulted in an inadvertent stall. Contributing to the accident was the pilot's lack of experience in the accident airplane make and model.",

"A total loss of engine power due to fuel starvation as a result of the pilot's improper fuel management. Contributing to the accident were the critical fuel placards that were difficult to see due to the airplane's paint scheme.",

'The pilot's impaired judgment, due to medications, which led to an abrupt low-level maneuver and subsequent impact with trees and terrain.',

'The flight crew's failure to maintain adequate wing tip clearance from a light pole during taxi.',

"The pilot's decision not to advance the engines to takeoff power during the go-around, as stipulated by the airplane flight manual, which resulted in an aerodynamic stall at a low altitude.",

"The repair station technician did not properly install the fuel inlet union during reassembly of the engine; the operator's maintenance personnel did not adequately inspect the technician's work; and the pilot who performed the post maintenance check flight did not follow the helicopter manufacturer's procedures. Also causal were the lack of requirements by the Federal Aviation Administration, the operator, and the repair station for an independent inspection of the work performed by the technician. A contributing factor was the inadequate oversight of the repair station by the Federal Aviation Administration, which resulted in the repair station performing recurring maintenance at the operator's facilities without authorization.",

"The pilot's failure to maintain adequate airspeed to avoid a low altitude stall, resulting in a loss of control and collision with terrain.",

'The failure of an aileron control cable due to a seized idler pulley bearing.',

"The pilot's loss of directional control during the takeoff roll.",

"The pilot's failure to ensure adequate runway remaining during landing.",

"The manufacturer's inadequate quality control and improper manufacture of the fuel servo diaphragm assembly, which resulted in fatigue cracking of the hub stud and subsequent loss of engine power due to fuel starvation.",

'The pilot's decision to fly with a known defective nosewheel assembly, which resulted in a loss of directional control and nose-over on landing after the assembly shifted out of alignment during the flight.',

"The pilot's delayed decision to abort the takeoff, which resulted in a runway overrun and a subsequent collision with obstacles and terrain. Contributing to the accident was the airplane's high gross weight.",

"The non-instrument rated pilot's decision to continue visual flight into instrument meteorological conditions, which resulted in a loss of airplane control.",

'The pilot's loss of aircraft control, due to spatial disorientation, resulting in the in-flight separation of the main rotor and tail boom.',

'The cardiac impairment of the pilot during a positioning flight.',

"The pilot's visual flight rules flight into instrument meteorological conditions, which resulted in his spatial disorientation and loss of helicopter control.",

'The pilot's continuance of the GPS approach below the minimum descent altitude while landing in instrument meteorological conditions.',

'The pilot's premature retraction of the landing gear and the flaps during landing. Contributing to the accident was the inadvertent dimming of the cockpit lighting, resulting in a perceived unsafe gear configuration.',

"The pilot's failure to maintain clearance from a fuel pump while taxiing. Contributing to the accident was the pilot's diverted attention.",

"The pilot's failure to identify and arrest the helicopter's descent due to spatial disorientation.",

"A loss of engine power due to fuel starvation as a result of the pilot's improper placement of the fuel selector.",

'The loss of engine power for undetermined reasons.'.

'The failure of a manufacturing splice of the right main landing gear tire\x92s inner tube, which resulted in a deflated tire and a consequent loss of directional control on landing.',

"The pilot-in-command's failure to maintain proper airspeed and his failure to initiate a go-around, which resulted in the airplane touching down too fast on a short, wet runway and a subsequent runway overrun. Contributing to the accident was the copilot's failure to adequately monitor the approach and call for a go around and the flight crew's lack of proper crew resource management.",

"The pilot-in-command's failure to attain the proper touchdown point while landing with a gusting crosswind and failure to initiate a go-around, which resulted in a landing more than halfway down the runway and a subsequent runway overrun. Contributing to the incident was the failure of either pilot to call for a go-around when the airplane was at Vref plus 15 at 50 feet above the runway or once they had floated well beyond the touchdown zone of the runway.",

'A total loss of engine power due to a loss of lubrication after the engine experienced a piston ring failure for undetermined reasons.',

"The pilot's excessive brake application during the landing roll after overshooting the intended touchdown point, resulting in a nose over.",

'The pilot\x92s failure to abort the takeoff, which resulted in an in-flight collision with terrain.',

'The pilot\x92s inadequate preflight inspection, which resulted in the loss of engine power due to water contaminated fuel.',

"The pilot's failure to maintain clearance from a transmission line during flight.",

"The improperly adjusted brakes and the pilot's failure to lock the tailwheel, resulting in a loss of directional control. Contributing to the accident was the pilot's decision to continue flying the airplane with a known brake deficiency.",

'The pilot\x92s failure to arrest the excessive rate of turn into the failed engine, which resulted in a loss of control and subsequent impact with terrain. Contributing to the accident was a partial loss of engine power for reasons that could not be determined because postaccident examination did not reveal any mechanical malfunctions or failures that would have precluded normal operation.',

"A total loss of engine power due to fuel exhaustion as a result of the pilot's inadequate fuel planning.",

'The failure of the flight crew to stop the airplane on the runway due to the flying pilot\x92s failure to attain the proper touchdown point. Contributing to the accident was an anti-skid system that was not performing optimally, which allowed the airplane to encounter reverted rubber hydroplaning, and the company-developed quick reference landing distance chart that did not provide correction factors related to tailwind conditions.',

"The flight crew's inability to stop the airplane during landing roll on a snow- and ice-contaminated runway. Contributing to the runway overrun were the deteriorating runway conditions.",

"The pilot's failure to maintain clearance from a highway marker sign while maneuvering.",

'The pilot did not ensure the airplane was loaded within its weight and balance envelope, which resulted in longitudinal instability and a loss of aircraft control during the initial climb.',

'The total loss of engine power during cruise flight for undetermined reasons.',

"The pilot's failure to maintain directional control during landing, which resulted in a runway excursion and noseover.",

'An interruption of fuel to the engine due to air in the fuel lines, which resulted in an engine flameout and the total loss of engine power. The reason for air in the fuel line resulting in an engine flameout could not be determined because postaccident testing did not reveal the mechanism that would

d lead to such a result.' ,

"The pilot's failure to maintain adequate airspeed during the approach, which resulted in an aerodynamic stall. Contributing to the accident was the pilot's failure to check the de-ice fluid level prior to takeoff, which resulted in the failure of the de-ice system to clear the windshield of ice.",

"The pilot's inadequate preflight inspection of the engine cowling latches prior the flight, which resulted in the cowling door opening in-flight and striking the main rotor blades.",

'

'

'The captain\x92s decision to continue the flight with the left engine backfiring, resulting in an engine fire shortly after takeoff. Contributing to the accident were the captain\x92s decision to continue the flight following a report of black smoke trailing the airplane and in-flight fire damage to the left wheel brake system, resulting in a loss of directional control during an emergency landing.',

"The pilot's failure to maintain directional control during the landing roll.",

'An in-flight overload failure of the left elevator inboard balance weight rib for undetermined reasons.',

'The pilot\x92s decision to land with a tailwind and his delay in executing a go around.',

"The pilot's failure to lower the landing gear while on approach to landing. Contributing to the accident was the pilot's failure to follow a written checklist during the approach portion of the flight.",

"The pilot's failure to maintain adequate airspeed during the approach/landing to compensate for the ice accumulated on the airframe which resulted in a hard landing.",

"The pilot\x92s failure to maintain airplane control while maneuvering. Contributing to the accident was the pilot's lack of experience in the accident airplane.",

'The fatigue fracture and subsequent failure of the No. 2 cylinder exhaust valve during cruise flight, which resulted in a total loss of engine power.',

"The pilot's failure to maintain adequate clearance from the safety skirting during the repositioning landing.",

"The pilot's inadequate compensation for gusty crosswinds during takeoff, which resulted in a loss of directional control.",

"The pilot's failure to maintain control of the airplane during landing in strong and gusty wind conditions.",

'The pilot\x92s continuation of the approach with excessive airspeed, which resulted in a hard landing and a loss of directional control.',

"The pilot's failure to maintain adequate airspeed during climb after takeoff, resulting in an aerodynamic stall.",

"The flightcrew's inadequate preflight inspection, resulting in in-flight structural damage to the airplane's fuselage from an unsecured pallet jack that was located in the airplane's empty cargo hold.",

'The pilot\x92s failure to maintain airplane control and to recover from an aerodynamic stall, which resulted in a spin.',

'The pitch trim control cable failed due to fatigue, rendering the elevator trim inoperative.',

'The pilot did not maintain minimum controllable airspeed while on final approach with a partial loss of power in the right engine, which resulted in a loss of control. Contributing to the accident was the partial loss of engine power in the right engine due to the improperly installed o-rings in the engine\x92s throttle and control assembly.',

"The pilot's improper flare which resulted in a hard landing. Contributing to the accident was the pilot's distracted attention due to the electrical system failure.",

"The pilot's loss of aircraft control during landing in gusty wind conditions.",

'Fatigue failure of the right flap extend cable during the landing approach.'

roach.',

'The failure of a utility pipe beneath the ramp surface, which caused a localized void in the soil and resulting reduction in the load bearing capability of the ramp.',

"The pilot's inadvertent application of control inputs that resulted in rapid, right-rolling, negative g-forces during night cruise flight and his subsequent ejection from the airplane. Contributing to the accident was the pilot's decision to fly at night in an airplane not approved for night flight, his unbuckling of the seat belt portion of the restraint harness, and the inadvertent opening of the airplane\x92s canopy.",

"The failure of the PA24 pilot to maintain adequate clearance from the PA28 resulting in an inflight collision. Contributing to the accident was the PA24 pilot's decision to overtake the PA28.",

"The pilot's continued visual flight rules flight into deteriorating weather conditions in an airplane not equipped for instrument flight, which resulted in a collision with terrain.",

"The pilot's failure to maintain a stabilized glide path which resulted in the airplane touching down short of the runway.",

"The pilot's failure to maintain directional control on the landing roll out. Contributing to the accident was the pilot's decision to attempt a landing in crosswind conditions that exceeded the maximum demonstrated capability of the airplane.",

'The pilot did not maintain adequate airspeed during the downwind turn resulting in an aerodynamic stall, in-flight loss of control, and spin. Contributing to the accident was the pilot\x92s inadequate preflight planning and exceedance of the approved weight and balance envelope.',

'An inadequate repair of the fuel tank that allowed the fuel leak to continue, ultimately resulting in an in-flight fire.\r',

'An encounter with convectively-induced turbulence and icing, which resulted in an in-flight upset and a loss of airplane control.',

"The pilot-in-command's failure to execute a go-around when the airplane was high and fast on the final approach.",

"The pilot's failure to maintain airplane control while on short final after experiencing a downdraft, which resulted in a subsequent hard landing.",

"The pilot's inadequate preflight inspection, in which he did not detect that less fuel was on board the airplane than planned, which precipitated a loss of engine power due to fuel exhaustion during initial descent.",

"The pilot's failure to maintain helicopter control while in a low hover.",

'The separation of the tail rotor drive gear shaft due to torsional fatigue of its threaded portion, which resulted in a loss of tail rotor control.',

'A total loss of engine power for undetermined reasons during the landing approach over unsuitable terrain.',

"The pilot's use of an excessive bank angle while in the airport traffic pattern, which resulted in an accelerated stall. Contributing to the accident were the pilot\x92s lack of experience in the airplane and the pilot\x92s distracted attention to the rough running engine.",

'The pilot\x92s inadequate yaw control of the helicopter while hovering.',

'The airplane\x92s failure to climb at a sufficient rate to clear trees and terrain beyond the end of the runway for reasons that could not be determined because postaccident examination did not reveal any mechanical malfunctions or failures that would have precluded normal operation.',

"The pilot's inadequate fuel consumption calculations, which resulted in a loss of engine power due to fuel exhaustion. Contributing to the accident was the pilot's decision to continue flight with known equipment deficiencies.",

"The pilot's decision to conduct low altitude flight at a high density

altitude and into a box canyon, which resulted in the airplane colliding with rising terrain when its climb capability was exceeded.",

'The pilot\x92s inadequate braking after touchdown, which resulted in a runway excursion.',

'The collapse of the right main landing gear during landing due to a lack of component lubrication, which resulted in the failure of the landing gear to lock once extended.',

'The in-flight separation of the tail rotor drive shaft cover as a result of maintenance personnel not ensuring that it was secured after a maintenance inspection; also causal was the pilot\x92s inadequate preflight inspection of the helicopter.',

"Inadequate maintenance of the helicopter's landing gear dampers, which resulted in a main rotor out-of-balance condition and ground resonance encounter.",

'The loss of engine power due to fuel contamination.',

'The non-instrument-rated pilots\x92 loss of situational awareness during a dark night flight over a remote area, which resulted in their failure to maintain an altitude sufficient to ensure adequate terrain clearance. Contributing to the accident was the pilots\x92 fatigue due to their long duty day.',

'A total loss of engine power during initial climb for undetermined reasons.',

'A loss of engine power for reasons that could not be determined because postaccident examination of the engine did not reveal any anomalies that would have precluded normal operation.',

'A partial loss of engine power immediately after takeoff for undetermined reasons. ',

"The private pilot's incorrect manipulation of the engine mixture control which resulted in an inadvertent engine shutdown.",

"The pilot's inadvertent application of the right brake pedal during the landing roll, which resulted in a nose-over.",

"The pilot's decision to take off in a variable wind, resulting in a shallow climb and collision with terrain.",

"The pilot inadvertently switching off the engine magnetos during the initial climb, resulting in a loss of engine power. Contributing to the accident was the manufacturer's placement of the magneto switches.",

'A total loss of engine power due to the separation of a tooth from the starter-generator drive gear, which resulted in failure of the engine oil pump and subsequent oil starvation.',

'The pilot\x92s improper decision to fly aerobatic maneuvers at low altitude, which resulted in a loss of control and impact with terrain. Contributing to the accident was the pilot\x92s impairment due to his recent use of multiple impairing drugs. \r\n\r',

'The improper installation of the nose landing gear strut and subsequent collapse of the nose landing gear during landing.',

'A total loss of engine power likely due to carburetor ice.',

'A total loss of engine power during cruise flight due to fuel exhaustion as a result of the pilot\x92s improper fuel planning.',

'Debris in the fuel system, which resulted in a loss of engine power due to fuel starvation. Also causal was the pilot not maintaining sufficient airspeed, which resulted in an aerodynamic stall.',

"The pilot's inadequate recovery from a bounced landing and subsequent failure to maintain aircraft control.",

"The pilot's decision to taxi the airplane across an unpaved area after the nosewheel inadvertently departed the ramp pavement.",

'A loss of engine power while maneuvering for reasons that could not be determined because postaccident examination did not reveal any anomalies that would have precluded normal operation.',

'The pilots\x92 failure to appropriately apply the landing gear wheel brakes after landing, to properly perform the hard brake pedal-no braking con

dition procedure following the reported brake failure and to apply the emergency brakes. The reason for the reported brake failure could not be determined because postincident examination did not reveal any malfunctions or failures that would have precluded normal operation of the brakes.\r',

'The total loss of engine power from both engines, which resulted from fuel exhaustion due to the pilot\x92s inadequate pre-flight preparation.',

'The total loss of left engine power due to fuel starvation, and the pilot\x92s improper configuration of the fuel system during remedial actions, which resulted in fuel starvation of the right engine. Contributing to the accident was the pilot\x92s incomplete preflight inspection and the pilot\x92s operation of the airplane with a known faulty fuel quantity indicating system.',

"The pilot's failure to maintain clearance from the parked, unoccupied airplane while taxiing. Contributing to the accident was the guidance provided by the marshaller.",

'The total loss of engine power during cruise flight for reasons that could not be determined because the airplane was not recovered. Contributing to the accident was the pilot\x92s failure to comply with the airplane and engine limitations, and his decision to fly over water beyond power-off gliding distance from shore.',

'The pilot\x92s loss of situational awareness after an inadvertent encounter with instrument meteorological conditions, which resulted in an in-flight collision with tree-covered terrain.',

"The pilot's fatal cardiac event, which resulted in the inflight loss of control of the airplane. Contributing to the accident was the pilot's use of impairing medications and operation of the airplane with disqualifying medical conditions.",

"The pilot's failure to maintain the recommended airspeed for icing conditions and his subsequent loss of airplane control while flying the airplane under autopilot control in severe icing conditions, contrary to the airplane's handbook. Contributing to the accident was the pilot's failure to divert from an area of severe icing. Also contributing to the accident was the lack of an advisory for potential hazardous icing conditions over the destination area.",

'A total loss of engine power during initial climb for reasons that could not be determined because postaccident examination of the airframe and engine did not reveal any anomalies that would have precluded normal operation.',

"The pilot's failure to maintain adequate separation behind a corporate jet, which resulted in an encounter with wake turbulence and a subsequent loss of control.",

"The pilot's inadequate compensation for the crosswind, which resulted in a loss of directional control.",

'The total loss of engine power due to fuel exhaustion and the pilot\x92s inadequate preflight inspection, which did not correctly identify the airplane\x92s fuel quantity before departure.',

'The pilot\x92s loss of directional control during the landing roll, which resulted in a runway excursion. Contributing to the accident was the sun glare.',

"The pilot's decision to land on unsuitable terrain, which resulted in the airplane nosing over.",

"The pilot-in-command's failure to obtain the proper touchdown point or landing reference speed and failure to initiate a go-around when it became evident that the airplane was landing long and fast. Contributing to the incident was a lack of effective flight crew coordination and communication.",

"The pilot's inadequate compensation for wind conditions during landing, which resulted in a hard landing.",

"The pilot's inadvertent overboost of the turbocharged engine during initial climb, which resulted in detonation and a partial loss of engine power followed by the pilot's failure to maintain airspeed and the instructor's delayed remedial action which resulted in an aerodynamic stall. Contributing to

the accident was the instructor's improper judgment in acting as a pilot with disqualifying medical conditions and while taking impairing medications.",

"The pilot's improper decision to taxi in wind conditions that exceeded the airplane's capability.",

'A flight control malfunction while maneuvering for reasons that could not be determined because postaccident examination revealed no evidence of a mechanical malfunction or failure that would have precluded normal operation.
\r\n\r\n\r\n\r',

'An in-flight collision with birds during cruise flight.',

"The pilot's decision to take off from an unsuitable off-airport site.",

'The pilot's inadequate preflight inspection when he did not remove a tie-down strap prior to takeoff, which resulted in a dynamic rollover.',

'The pilot's failure to maintain directional control when the right brake locked up during the landing roll for reasons that could not be determined because postaccident examination did not reveal any anomalies that would have precluded normal operation.',

'The pilot's lack of situational awareness regarding the surrounding terrain while descending during dark night conditions, which resulted in controlled flight into terrain. \r\n\r',

"The pilot's failure to land with sufficient runway remaining to stop, which resulted in an unsuccessful aborted landing, inadvertent stall, and collision with terrain.",

"The pilot's failure to maintain directional control during a go-around maneuver in gusty crosswind conditions.",

'The maintenance technician did not remove the tow bar prior to the flight.',

'A total loss of engine power due to oil starvation at the Nos. 5 and 8 engine bearings, which resulted in a catastrophic engine failure.',

"The pilot's decision to use automotive fuel instead of the approved alternate fuel, which resulted in a total loss of engine power.",

"A complete loss of engine power due to fuel exhaustion as a result of the pilot's failure to verify that sufficient fuel was onboard prior to flight. Contributing to the accident was the pilot's misreading of the fuel ticket and his improper operation of the fuel control panel , and his delay in recognizing the fuel shortage.",

"The pilot's failure to ensure that he was aware of the NOTAM describing the runway closure, which resulted in a landing on the closed runway and subsequent collision with a barrier. Contributing to the accident was the failure of air traffic control personnel to include the runway closure information on the recorded ATIS information, which the pilot had listened to prior to landing.",

"The pilot's improper preflight planning and inflight fuel management, which resulted in a total loss of engine power due to fuel exhaustion.",

'The fatigue failure of two turbine engine blades due to vibration.',

'The intermittent loss of engine power due to a "stuck" stepper motor in the No. 2 engine's fuel control as a result of an inadequate overhaul. Contributing to the accident was the pilot's decision to continue flying the helicopter with a known defect, his decision to depart with the helicopter over its maximum gross weight, and his decision to fly the approach to the oil platform at a high gross weight in a direction that provided limited go-around potential.',

'An uncommanded landing gear retraction after touchdown for reasons that could not be determined because postaccident examination did not reveal any mechanical malfunctions or failures that would have precluded normal operation.',

'Impingement of the elevator control by foreign objects (clamp, glove) left in the flight control path by the pilot/owner or maintenance personnel.',

'A loss of tail rotor drive due to a fatigue failure of the main trans

mission pinion, which resulted in a loss of directional control during cruise flight.',

'The loss of engine power due to an excessively rich fuel mixture that occurred during operations at idle power settings at a high density altitude. Contributing to the accident was the flight instructor\x92s poor decision-making in choosing to practice an unnecessary autorotation over mountainous terrain.'

"The pilot's failure to maintain adequate visual lookout while taxiing near a hangar, which resulted in airplane's right wingtip impacting the hangar door.",

'The improper installation of the mixture cable by maintenance personnel, which allowed the mixture cable to entangle with the landing gear during gear extension and led to the subsequent loss of engine power.',

'The pilot's loss of directional control during an emergency landing on a paved highway.'

'An in-flight emergency followed by a collision with terrain for reasons that could not be determined because postaccident examination of the airframe, engine, and forward and aft canopies revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.',

'The pilot\x92s loss of directional control during the landing roll, which resulted in a runway excursion.',

'The inflight collision with birds, resulting in damage to the rotor head assembly and a subsequent forced landing and rollover.',

"The pilot's failure to go around after not attaining the proper touch down point, which resulted in a runway excursion and noseover.",

"The pilot's decision to continue the landing on a short grass runway with a tailwind after touching down beyond the touchdown point, and his subsequent failure to stop the airplane before colliding with trees off the end of that runway. Contributing to the accident was the pilot's lack of recent flight experience.",

'A failure of the No. 2 cylinder connecting rod due to a lack of lubrication, which resulted in a total loss of engine power.',

'The airplane\x92s collision with a deer during the landing roll.'

"The flight crew's failure to obtain the proper airspeed for landing, which resulted in the airplane touching down too fast with inadequate runway remaining to stop and a subsequent runway overrun. Contributing to the accident were the failure of either pilot to call for a go-around and the flight crew's poor crew resource management and lack of professionalism.",

"The pilot's inadequate preflight route planning and in-flight route and altitude selection, which resulted in an in-flight collision with a communications tower in possible instrument meteorological conditions. Contributing to the accident were the pilot's improper use of the enhanced ground proximity warning system's terrain inhibit switch and the air traffic controller's failure to issue a safety alert regarding the proximity of the tower.",

'Landing gear collapse for reasons that could not be determined because testing could not replicate the problem.'.

"The pilot's failure to maintain altitude/clearance from terrain during cruise flight at low altitude, which resulted in an in-flight collision with water. A contributing factor was the pilot\x92s diverted attention to adjust the engine power.",

"The pilot's inadvertent flight into thunderstorm activity, which resulted in the loss of airplane control and the subsequent exceedance of the airplane's design limits and in-flight breakup. Contributing to the accident was the failure of air traffic control personnel to use available radar information to provide the pilot with a timely warning that he was about to encounter extreme precipitation and weather along his route of flight or to provide alt

ernative routing to the pilot. ,

"The pilot's failure to ensure a suitable landing surface.",

"A total loss of engine power due to water contamination of the fuel, the pilot/owner's inadequate preflight inspection of his airplane, and his failure to maintain airplane control after the engine failure.",

"The pilot's failure to extend the landing gear before touchdown. Contributing to the accident was the pilot's failure to perform the appropriate checklist due to distractions posed by another airplane inbound to the same airport and a cluttered radio frequency.",

"The pilot's selection of unsuitable terrain for landing.",

'A total loss of engine power due to the failure of the crankshaft, which resulted from the application of insufficient torque on the cylinder through-bolts by maintenance personnel. \r',

'The pilot\x92s inadequate preflight inspection, which failed to detect the unsecured cowling latches and resulted in the in-flight opening of an engine cowling.',

'The incomplete maintenance performed by maintenance personnel, which resulted in a total loss of engine power.',

'The pilot\x92s failure to maintain adequate clearance from rising terrain while flying toward the rising sun, which interfered with his ability to see the terrain.',

'A temporary loss of control during cruise flight for reasons that could not be determined because postincident examination of the autopilot, pitch trim systems, and horizontal stabilizer revealed no anomalies consistent with a loss of control.\r',

'A total loss of engine power for reasons that could not be determined during the postaccident investigation and testing.',

'The improper installation of the wastegate controller O-ring, which resulted in a partial loss of engine power.',

"The mechanic's failure to adequately torque the right magneto attachment nuts, allowing the right magneto to come loose, which allowed engine oil to escape, causing the engine to seize.",

"The pilot's failure to maintain airplane control on takeoff, which resulted in an inadvertent stall. Contributing to the accident were the unlatched nose cargo door, the pilot\x92s diverted attention, and the pilot's mental ability to handle the emergency situation.",

"The pilot\x92s failure to maintain directional control of the tailwheel-equipped airplane during a takeoff in gusty crosswind conditions. Contributing to the accident was the pilot's decision to take off in gusty wind conditions associated with approaching thunderstorms.",

"The pilot's failure to maintain airplane control while maneuvering, resulting in an aerodynamic stall/spin with insufficient altitude to recover.",

'Disconnection of the upper rod end from the fore/aft servo due to severely worn threads, which resulted in a loss of control and separation of a main rotor blade during cruise flight. Contributing to the accident were incorrect maintenance procedures and inadequate maintenance inspections performed by the operator, and insufficient inspection criteria provided by the helicopter manufacturer.',

'The pilot\x92s failure to maintain proper airspeed, which resulted in the airplane touching down too fast on the wet runway with inadequate runway remaining to stop and a subsequent runway overrun. Contributing to the landing overrun were the flight crewmembers\x92 failure to correctly use the appropriate performance chart to calculate the runway required to stop on a contaminated runway and their general lack of proper crew resource management. \r',

'A catastrophic engine failure due to unrecognized and unrepaired corrosion within the engine, which was consistent with engine operations after an extended period of inactivity.',

"The pilot's failure to maintain adequate obstacle clearance while taxiing.",

'Failure of the nosewheel steering computer strut servo for reasons th

at could not be determined or replicated during postincident testing.',

"The pilot's failure to properly manage the helicopter's available fuel supply, which led to a total loss of engine power due to fuel exhaustion. Contributing to the accident was the improper calibration of the fuel gauge and the fuel-low warning light.",

"The pilot's decision to take off with ice- and snow-contaminated wings.",

'The pilot\x92s inadequate braking action and decision to abort the landing near the departure end of the runway. Contributing to the accident was the pilot\x92s attempt to land near the midpoint of the runway.',

"The pilot's loss of control during an instrument approach due to spatial disorientation. Contributing to the accident were deficient approach control services and the pilot's loss of positional awareness.",

"The pilot's failure to maintain sufficient rotor rpm during a precautionary landing, which resulted in a hard landing.",

"The pilot's decision to make multiple low passes over the glassy surface water, which resulted in an impact with the surface of the lake.",

"The pilot's loss of airplane control during final approach in gusty wind conditions.",

'The pilot\x92s decision to continue visual flight rules flight into instrument meteorological conditions due to self-imposed pressure to complete the trip, which resulted in impact with trees and terrain.\r',

"The pilot's improper decision to perform a downwind precautionary landing and the helicopter\x92s resultant settling with power and impact with terrain.",

"The pilot's attempted visual flight rules (VFR) flight into marginal VFR conditions on a dark night over water and his failure to maintain sufficient altitude, which resulted in the airplane\x92s controlled flight into water. Contributing to the accident was the pilot's inadequate preflight weather planning.",

'The pilot\x92s loss of control of the airplane for reasons that could not be determined because the wreckage was not recovered from the accident site.',

'The pilot\x92s decision to depart under visual flight rules in dark night instrument meteorological conditions, which resulted in subsequent spatial disorientation, uncontrolled descent, and impact with trees and terrain.\r',

"The pilot's decision to attempt an instrument approach in meteorological conditions below approach minimums and his failure to properly execute a missed approach.",

'The helicopter\x92s sudden and severe vertical vibrations during landing, which resulted in a collision with terrain. The reason for the helicopter\x92s sudden and severe vertical vibrations could not be determined during postaccident examinations.\r\n\r',

'The pilot\x92s unintentional and unrecognized entry into a vortex ring state as a result of conducting a course reversal turn into a tailwind while at a low altitude and airspeed, which resulted in an uncontrolled descent into water.\r',

"The select/bypass valve's failure to seal correctly because of improper shimming, which resulted in an uncommanded and uncontrollable left turn during landing. Contributing to the accident was the overhaul facility's improper overhaul of the steering manifold.",

"The pilot's improper recovery from a bounced landing, which resulted in a loss of control.",

"The pilot's failure to maintain airplane control after he shut down the right engine in flight due to a loss of oil pressure. Contributing to the accident was the pilot's decision to reposition the unairworthy airplane during twilight after extensive maintenance had been done to the right engine along with a known mechanical deficiency with the landing gear. Contributing to the accident was the mechanic's improper assembly and installation of the right engine.

ngine's oil filter adapter, which resulted in a loss of oil to that engine.\r\n\r\n\r\n\r\n\r\n\r\n\r\n",

'The total loss of engine power due to the loss of oil to the engine. Contributing to the accident was maintenance personnel\x92s improper installation of the engine oil filter adaptor, which resulted in the loss of oil to the engine.\r',

"The pilot's improper fuel management and his excessive slip maneuver, which led to fuel starvation and a total loss of engine power, and his failure to activate the electric boost pump during the attempted engine restart.",

'The pilot\x92s decision to continue the flight into an area of extreme weather, which led to the in-flight encounter with a thunderstorm and structural failure of the wings and tail.\r',

"The pilot's visual disorientation, which resulted in a collision with the lake.",

'The noninstrument-rated pilot\x92s improper decision to depart in dark, night marginal visual flight rules conditions, which resulted in his spatial disorientation and subsequent loss of airplane control. \r',

"The pilot's failure to maintain main rotor rpm during takeoff, which resulted in a hard landing and subsequent rollover.",

'The snowplow driver\x92s failure to ensure that the runway was clear before driving onto it, which resulted in a runway incursion with a departing airplane.',

'The noncertificated pilot\x92s failure to maintain clearance from terrain while maneuvering to land in dark night conditions likely due to his geographic disorientation (lost). Contributing to the accident was the pilot\x92s improper decision to fly at night with a known visual limitation.',

'The pilot\x92s failure to maintain clearance with a parked helicopter during takeoff.',

"The loss of engine power due to ice ingestion. Contributing to the accident was maintenance personnel\x92s delayed decision to install the helicopter's engine inlet cover until after the engine had been exposed to moisture and freezing temperatures and their inadequate daily preflight/airworthiness checks, which did not detect the ice formation.",

'The pilot\x92s inadvertent encounter with localized icing conditions and his subsequent in-flight loss of helicopter control.',

'The pilot\x92s inadvertent encounter with severe icing conditions, which resulted in structural icing and the subsequent loss of airplane control.\r',

"The pilot's encounter with convective weather, which resulted in a loss of airplane control.",

"The pilot's failure to maintain airplane control due to spatial disorientation during the initial climb after takeoff in night instrument flight rules conditions.",

'A total loss of engine power during initial climb due to fuel starvation, which resulted from maintenance personnel\x92s improper installation of the fuel selector handle. Contributing to the accident was an incorrectly modified fuel selector handle assembly. \r',

'The flight instructor\x92s and commercial pilot\x92s failure to see and avoid the other airplane, which resulted in a collision during cruise flight. Contributing to the accident was the failure of the flight instructor of the other airplane to activate the transponder before departure, which resulted in no traffic advisories being issued before the collision.',

'The pilot\x92s decision to take off into deteriorating weather conditions, which resulted in a loss of visual reference and the subsequent controlled flight into terrain. Contributing to the severity of the rear seat passenger\x92s injuries was the incorrect installation of the rear seat belts.\r',

'The line technician\x92s failure to remove the refueling mat from the helicopter fuselage following servicing, which resulted in the mat striking the tail rotor in flight, and the pilot\x92s inadequate preflight inspection.',

'The pilot\x92s failure to properly identify the aircraft which would have been involved in the collision. Contributing to the accident was the pilot\x92s failure to maintain clearance with the other airplane during the initial climb after takeoff in night instrument flight rules conditions.',

'The pilot's failure to properly selectivity the altitude, which resulted in him landing the airplane off of the airstrip in soft soil causing the nose over.',

'The pilot's improper fuel management, which resulted in a loss of engine power due to fuel exhaustion.',

'The pilot's failure to maintain control of the airplane while landing in gusting wind conditions.',

"The pilot's failure to follow airplane flight manual procedures for an antiskid failure in flight and his failure to immediately retract the lift dump after he elected to attempt a go-around on the runway. Contributing to the accident were the pilot's lack of systems knowledge and his fatigue due to acute sleep loss and his ineffective use of time between flights to obtain sleep. \r\n\r\nMember Sumwalt filed a concurring statement that can be found in the public docket for this accident. Member Weener joined the statement.",

'The pilot's failure to transfer fuel from the auxiliary fuel tanks to the main fuel tanks in a timely manner, which resulted in fuel starvation to the engine. \r',

'The loss of engine power due to engine ice ingestion during initial climb after takeoff in dark night light conditions. Contributing to the accident were the lack of an installed engine air inlet cover while the helicopter was parked outside, exposed to precipitation and freezing temperatures before the accident, and the pilot's inadequate preflight inspection that failed to detect ice accumulation in the area of the air inlet. \r\n \r',

"The cabin attendant's failure to follow published guidance and checklists before and during landing.",

'The pilot's failure to maintain control due to a sudden turbulence encounter while on final approach. Contributing to the accident was ice build up on the wings' leading edges.',

'The obstruction of the right engine's induction air system by ice, which resulted in a loss of engine power.\r',

"The pilot's improper placement of the fuel tank selector handle during approach, which resulted in a total loss of engine power due to fuel starvation.",

"The private pilot's inadequate response to the dual engine shutdown during cruise descent, including his failure to adhere to procedures, which ultimately resulted in his failure to maintain airplane control during a single-engine go-around. An additional cause was the pilot's decision to allow the unqualified pilot-rated passenger to manipulate the airplane controls, which directly resulted in the inadvertent dual engine shutdown.",

'The total loss of engine power for reasons that could not be determined based on the available evidence.',

'The pilot's inadvertent cyclic control input after landing, which resulted in the main rotor blades striking the ground.',

'The disconnection of the nose landing gear actuator, which resulted in the subsequent collapse of the nose landing gear. Contributing to the accident was the repair station's inadequate maintenance, postmaintenance inspection process, and oversight of the maintenance performed and the lack of communication between the repair station personnel, the operator, and the testing technician. \r\n\r',

'The failure of the main landing gear brake system's antiskid system, which resulted in locked wheels during landing.',

'The failure of the nose landing gear steering manifold during landing, which resulted in an uncommanded and uncontrollable right turn, and the overhaul facility's improper overhaul of the nose landing gear steering manifold. \r',

'The loss of engine power due to fuel starvation for reasons that could not be determined because a postaccident examination of the airframe and engine did not reveal any anomalies that would have precluded normal operation.',

'The pilot's failure to adequately monitor the runway environment during taxi, which resulted in an on-ground collision.\r',

"The improper decision by the pilot to attempt a flight with a known fuel system-related maintenance discrepancy, which resulted in a fuel imbalance and subsequent fuel starvation during an approach to an alternate airport with a rough field. Contributing to the accident were the manufacturer's failure to incorporate a warning on AT-302 airplanes and to add a warning about this issue in the AT-302 flight manual.",

"Failure of maintenance personnel to reattach the landing gear squat switches following maintenance, which rendered the airplane's steering, braking, and thrust reverser systems inoperative during landing. Contributing to the accident were the failure of both the maintenance facility mechanics and the airplane operator's mechanic and flight crew to identify the error during postmaintenance checks, a failure of the airplane's pilot to apply the emergency brakes in a timely manner, and the copilot's decision to attempt to engage the thrust reversers as the airplane approached the runway end despite multiple indications that they were inoperative and producing partial forward, rather than reverse, thrust.",

'The loss of engine power during takeoff for reasons that could not be determined because postaccident examination of the airframe and engine did not reveal any anomalies that would have precluded normal operation.',

'The lack of a forward clamp on the carburetor heat box rubber boot, which allowed the boot to be ingested into the inlet of the carburetor heat box, restricting the airflow and leading to a subsequent partial loss of engine power.',

"The pilot's failure to lean the fuel mixture during takeoff in high-density altitude conditions, which resulted in a loss of engine power.",

"The pilot's failure to see and avoid a power line during the low-altitude flight.",

'The pilot\x92s loss of helicopter control due to spatial disorientation when he inadvertently encountered night, instrument meteorological conditions, which resulted in the in-flight separation of the main rotor and tailboom.\r',

"The balloon's encounter with unforeseen strong gusting wind, which resulted in a high-wind landing. Contributing to the accident was the National Weather Service's misjudgment of the timing and underestimation of the magnitude of the frontal boundary moving across the region.",

'The loss of engine power due to fuel exhaustion as a result of the manufacturer providing the incorrect Pilot\x92s Operating Handbook to the owner, which prevented the pilot from accurately calculating the fuel requirements before the flight. Contributing to the accident were the pilot\x92s inadequate preflight planning and poor decision-making. \r',

"Maintenance personnel's failure to secure the left engine idler pin during overhaul, which resulted in a catastrophic engine failure and subsequent forced landing.",

'The pilot\x92s failure to identify the water contamination of the fuel system during his preflight inspection, which resulted in a total loss of engine power during the airplane\x92s initial climb.',

"The pilot's improper fuel planning and management, which resulted in a loss of engine power due to fuel exhaustion.",

'\r\nThe student pilot\x92s failure to maintain control of the helicopter while landing, which resulted in a tail rotor ground strike and collision with terrain. \r',

"The Federal Aviation Administration's (FAA) inadequate procedures, which did not require specific separation between aircraft operating on nonintersecting runways where flightpaths may intersect and led to an airborne conflict between two aircraft. Contributing to the incident was the FAA's failure to correct a known procedural deficiency that had previously caused repeated hazardous intersecting flightpath events.",

"The failure of the pilot to maintain aircraft control during a practice autorotation maneuver and the pilot providing training's delayed remedial action which resulted in a hard landing. Contributing to the accident was the lack of communication between the two pilots.",

"The flight crew's failure to execute a go-around during a non-stabilized approach, which resulted in a runway overrun.",

"The pilot's failure to maintain airplane control while aligning the airplane with the runway for landing, which resulted in the airplane exceeding its critical angle of attack and experiencing an aerodynamic stall. Contributing to the accident was the pilot's distraction during landing due to the effects of an inoperative generator.\r\n\r",

'The failure of one of the engine cylinders, which resulted in the total loss of engine power and subsequent forced landing.',

'The improper routing of the seatbelt, which resulted in the inadvertent deployment of the reserve parachute, and the open jump door, which allowed the passenger to be pulled from the airplane.',

"The pilot's failure to abort the takeoff during the ground roll after detecting the airplane's degraded performance. Contributing to the accident was the pilot's decision to attempt a flight with a known problem with the left engine and the likely partial loss of left engine power for reasons that could not be determined during the postaccident examination of the engine.\r\n\r\n\r",

"The pilot's failure to maintain directional control and crosswind compensation during landing.",

'The in-flight disengagement of the tail rotor extension shaft from the tail rotor gearbox, resulting in a loss of tail rotor control.',

"The pilot's inability to counter an unexpected wind gust after touchdown, which resulted in a loss of directional control.",

"The pilot's inadequate preflight fuel planning, which resulted in departure with insufficient fuel to complete the flight, and consequent inflight power loss due to fuel exhaustion.",

"The pilot's failure to fly the approach at the appropriate landing speed and attain the correct touchdown point, which resulted in a runway overrun.",

'A total loss of engine power due to the failure of the engine crankshaft, which resulted from maintenance personnel's application of insufficient torque on the engine case through bolts.',

'An in-flight fire and subsequent loss of engine power for reasons that could not be determined due to extensive fire damage to the airplane and its fuel and electrical systems.',

'The failure of the nose landing gear (NLG) actuator attachment bolt due to fatigue for reasons that could not be determined during postincident examination, which resulted in the NLG collapsing during landing.\r',

'The airplane's encounter with a flock of American White Pelicans, which resulted in one bird striking the right outboard wing during en route climb from the departure airport.\r',

'The pilot's improper brake application during landing, which resulted in a loss of directional control.\r',

"The non-instrument rated pilot's inadvertent encounter with instrument meteorological conditions during initial climb and his improper decision to continue flight, which resulted in an in-flight impact with a tree and an emergency descent that resulted in a roll over on landing.",

"The airplane's encounter with severe icing conditions, which resulted in structural icing, and the pilot's increased workload and subsequent disorientation while maneuvering in instrument flight rules (IFR) conditions with malfunctioning flight instruments, which led to the subsequent loss of airplane control. Contributing to the accident was the pilot's decision to takeoff in IFR conditions and fly a single-pilot operation without a functioning autopilot and with malfunctioning flight instruments.",

'Controlled flight into terrain for reasons that could not be determined from the available evidence '

'The pilot\x92s inadvertent encounter with night, instrument meteorological conditions while responding to an obstacle alert, resulting in an in-flight loss of helicopter control.\r',

'The pilot's improper decision to continue flight into known icing conditions, which adversely affected the airplane's performance and resulted in a loss of airplane control.'
r'.

"The pilot's improper flare, which resulted in a loss of aircraft control and hard landing.",

"The pilot's failure to maintain aircraft control while maneuvering during a long-line operation.",

"The pilot's failure to maintain control of the airplane following an inflight deployment of the left engine thrust reverser. Contributing to the accident was the flight crew's failure to perform the appropriate emergency procedures, the copilot's lack of qualification and capability to act as a required flight crewmember for the flight, and the inflight deployment of the left engine thrust reverser for reasons that could not be determined through postaccident investigation.",

'A partial loss of engine power as a result of contamination of the engine\x92s fuel supply, and the pilot\x92s impaired performance due to his use of diphenhydramine, which resulted in his inability to complete a forced or precautionary autorotative landing successfully.\r',

"The passenger's accidental discharge of the net gun which resulted in the net going through a main rotor blade.",

'The pilot\x92s failure to maintain adequate airspeed while maneuvering at a low altitude, which resulted in an aerodynamic stall/spin and subsequent impact with terrain. \r',

'The pilot\x92s inadequate preflight and inflight fuel planning, which resulted in a total loss of engine power due to fuel exhaustion. Contributing to the pilot\x92s injuries was his failure to use the available shoulder harness.\r'.

"The pilot's loss of control while landing on a mobile helipad."

"The flight crew's failure to maintain airplane control during landing following an unstabilized approach. Contributing to the accident were the flight crew's decision to land with a tailwind above the airplane's operating limitations and their failure not to conduct a go-around when the approach became unstabilized.",

'The pilot\x92s failure to maintain tail rotor clearance from a handrail on a crane davit on an oil platform during landing.'.

"The pilot's controlled flight into terrain during an instrument landing system approach at night in instrument flight rules conditions. Contributing to the accident were the operator's inadequate training of the pilot, the operator's failure to provide a level of oversight commensurate to the pilot's experience, and the pilot's lack of operational experience in actual night instrument conditions in the make and model of the airplane.".

'The pilot's use of an improper clutch engagement procedure, which resulted in clutch glazing, slippage, and, ultimately, the in-flight disengagement of the clutch and a loss of rotor rpm. Contributing to the accident were the installation of a light-weight clutch assembly and a higher horsepower engine, both of which increased the tendency for clutch slippage, and inadequate inspection of the clutch assembly. \r',

'The in-flight failure of both engines due to water contamination.',

"The total loss of engine power due to fuel exhaustion, which resulted from the pilot's inadequate pre-flight planning and decision-making.",

'A catastrophic engine failure, which was initiated by the failure of the No. 5 connecting rod cap.'.

"The pilot's decision to reengage the hydraulic system following the unsuccessful extension of the landing gear using the emergency extension procedure was a critical factor in the accident." (Source: NTSB)

res. Contributing to the accident was the failure of the directional control valve in the gear-up position and the release of the gear down locks for undetermined reasons.",

'The pilot\x92s descent below the published minimum descent altitude for or the instrument approach procedure, which resulted in impact with a utility pole.\r',

'The probable cause of the uncontained No. 2 engine failure on the Raytheon Beechjet 400A was a herring gull birdstrike that resulted in fan blade contact with the inlet case and rub induced excitation of a previously unidentified natural frequency (resonance) within the engine operating range.',

'The pilot inadvertently raised the landing gear lever rather than the adjacent flap lever while exiting the runway which resulted in the retraction of the left main landing gear.',

'The loss of helicopter control due to a loss of hydraulic boost to the tail rotor pedal controls at takeoff, followed by a loss of hydraulic boost to the main rotor controls after takeoff. The reason for the loss of hydraulic boost to the main and tail rotor controls could not be determined because of fire damage to hydraulic system components and the lack of a flight recording device.',

"The pilot's failure to maintain control of the airplane while landing in gusty wind conditions.\r\n\r",

"The pilot's loss of yaw control during takeoff due to the absence of hydraulic boost to the tail rotor pedals for reasons that could not be determined based on the available information. A finding in the accident was the lack of a caution indicator to alert the pilot of the lower hydraulic system configuration.\r\n\r\n\r\n\r",

'The failure of the nose gear actuator attachment to the engine mount due to overstress, which resulted in the loss of directional control during landing.',

'The pilot\x92s improper fuel planning, which resulted in a total loss of engine power due to fuel exhaustion.\r',

"The pilot's inability to control the airplane while taxiing due to a strong crosswind condition.",

'Wear in the left cabin door assembly parts, which resulted in the door partially opening in flight, dislodging from the lower door track assembly, and then separating from the helicopter.',

'Maintenance personnel\x92s application of insufficient torque to the engine cylinder through bolts during replacement of the No. 1 cylinder, which resulted in the displacement of the No. 2 main bearing, the bearing shifting, and a catastrophic engine failure.\r\n\r',

'The probable cause of the uncontained No. 2 engine failure on the Raytheon Beechjet 400A was a yellow-crowned night-heron birdstrike that resulted in fan blade contact with the inlet case and rub induced excitation of a previously unidentified natural frequency (resonance) within the engine operating range.',

'The pilot\x92s decision to exit the helicopter while it was running and his failure to properly secure the flight controls with the engine operating at flight idle before exiting the helicopter.',

"The pilot's failure to maintain aircraft control after the helicopter's skid catching on the side of a trailer during takeoff, which resulted in a dynamic rollover.",

'An extreme vibration immediately after entering forward flight for reasons that could not be determined because postaccident examination of the helicopter did not reveal any anomalies that would have precluded normal operation. Contributing to the accident was the pilot\x92s inability to maintain helicopter control during the landing. ',

'The improper rigging of the landing gear by maintenance personnel, which resulted in the landing gear collapse.',

"The pilot's loss of control while entering a vortex ring state (settling with power) condition, which resulted in a hard landing.",

'A total loss of engine power due to fuel starvation. Contributing to the accident was the pilot's failure to land as soon as possible when the master caution warning light first illuminated as prescribed and his failure to ensure the proper setting of the caution panel segment lights before the flight.',

"The pilot's loss of control of the airplane during landing on water due to an encounter with wind shear, which resulted in the airplane's abnormal contact with the surface.",

"The pilot's failure to maintain control of the airplane during landing in gusty wind conditions.",

"The flight crewmembers' failure to perform the flight control check before takeoff, their attempt to take off with the gust lock system engaged, and their delayed execution of a rejected takeoff after they became aware that the controls were locked. Contributing to the accident were the flight crew's habitual noncompliance with checklists, Gulfstream Aerospace Corporation's failure to ensure that the G-IV gust lock/throttle lever interlock system would prevent an attempted takeoff with the gust lock engaged, and the Federal Aviation Administration's failure to detect this inadequacy during the G-IV's certification.",

"The pilot's failure to maintain airplane control while operating in instrument flight rules (IFR) conditions, which was due to spatial disorientation resulting from erroneous heading and bank angle information shown on the primary flight display. Contributing to the accident were the pilot's impairment due to diphenhydramine and his improper decision to operate in IFR conditions with the airplane over gross weight and at an aft center of gravity. \r\n\r\n\r\n\r\n\r",

"The pilot's fall from the balloon's basket during touchdown in a field for reasons that could not be determined based on the available evidence, which resulted in his fatal injury.",

"The pilot's failure to maintain aircraft control during an aborted landing due to an encounter with a tailwind.",

"The pilot's decision to continue flight into deteriorating weather conditions in an airplane not maintained for instrument flight, which resulted in a loss of control due to spatial disorientation.",

"The pilot's loss of situational awareness during the takeoff roll resulting in a collision with a refrigeration trailer.",

"The pilot's inability to maintain directional control during a crosswind landing.",

'The pilot's failure to maintain a stabilized approach and his subsequent failure to maintain airplane control during the landing flare, which resulted in touchdown off the side of the runway and collision with a ditch. \r\n\r',

'The pilot's improper decision to operate the airplane at low altitude and deliberately in close proximity to the boat operators, which resulted in a collision with a boat operator.\r',

'The pilot's failure to reposition the yaw servo hydraulic switch to the \x93on\x94 position during the pretakeoff hydraulic system check, which resulted in a complete lack of hydraulic boost to the tail rotor system and increased the load required to move the control pedals and led to the pilot's subsequent inability to manipulate the control pedals and his loss of yaw control.\r',

"The pilot's failure to follow the manufacturer's engine shutdown procedure.",

"The pilot's failure to maintain control during landing.",

"The pilot's inadvertent visual flight into instrument meteorological conditions, which resulted in a loss of helicopter control.",

"The failure of the 2nd-stage turbine wheel due to an improper repair of the 2nd-stage stator assembly, which the manufacturer does not consider a repairable item. Contributing to the incident was the designated engineering representative's approval of the repair process.",

'The backfire of the engine and its loss of power for reasons that cou

ld not be determined based on the available evidence.\r\n\r',

'The noninstrument-rated pilot\x92s inadequate preflight weather planning and subsequent inadvertent encounter with instrument meteorological conditions, which resulted in spatial disorientation and the loss of airplane control. Contributing to the accident was the pilot\x92s decision to continue the flight in deteriorating weather conditions.\r',

'A partial blockage of the No. 2 bearing oil nozzle jet by bearing material, which resulted in oil starvation and the subsequent failure of the No. 2 bearing and total loss of engine power.\r',

'The pilot\x92s inadequate preflight inspection that did not detect th at the bulk fuel tank was full and led to an unanticipated heavy airplane wei ght and his failure to use the entire soft, wet, and muddy airstrip length fo r takeoff, which resulted in a takeoff overrun.\r\n\r',

"The pilot's inadequate landing technique that resulted in a landing a rea overrun. Contributing was the glassy water conditions.",

"The pilot's failure to maintain a proper glide path and airspeed on f inal approach, which resulted in a long landing and runway excursion.",

'The pilot\x92s failure to properly manage the airplane\x92s fuel supp ly, which led to fuel starvation and a total loss of engine power.\r',

'A loosening of the engine throttle cable from its support clamp durin g flight, which resulted in a loss of throttle control.\r',

"The pilot's inadequate preflight planning, which resulted in an attem pted takeoff over the airplane's maximum gross weight and beyond its aft cent er of gravity limit. Contributing to the accident was the pilot's lack of tot al flight experience in the aircraft make and model.",

"The pilot's failure to adequately secure cargo (a jacket), which resu lted in the jacket exiting the cabin compartment and colliding with the tail rotor during cruise flight.",

'The inadequate torque of the propeller mounting bolts and inspection of the propeller, which resulted in the fatigue fracture of the bolts and a s ubsequent in-flight separation of the propeller assembly.',

"The second-in-command's (SIC) engagement of the emergency parking bra ke (EPB), which decreased the airplane's braking performance and prevented it from stopping on the available runway. Contributing to the SIC's decision to engage the EPB was the lower-than-anticipated deceleration due to a wet-runway friction level that was far lower than the levels used to determine the wet -runway stopping distances in the Airplane Flight Manual (AFM) and necessitat ed a landing distance considerably greater than that published in the AFM.",

"The pilot's inadequate preflight inspection when he did not remove a tie-down strap prior to takeoff, which resulted in a dynamic rollover.",

'The lack of flat roller bearings in the two elevator trim tab actuato rs and maintenance personnel\x92s inadequate lubrication of the left elevator trim tab actuator, both of which resulted in the overstress fracture of the l eft internal screw and subsequent in-flight failure of the pitch trim syste m.\r',

"The pilot's improper fuel management, which resulted in losses of pow er on both engines due to fuel exhaustion.",

'The pilots decision to land and failure to maintain control of the ai rplane during landing in gusty wind conditions.',

'The failure of the main landing gear tire, which resulted in separati on of the servo block and subsequent total loss of all hydraulic system press ure and prevented the landing gear from extending before landing.',

"The pilot's failure to maintain directional control during takeoff.",

"The pilot's failure to maintain clearance from trees while maneuverin g.",

"The pilot's failure to maintain lateral control of the airplane after a reduction in left engine power and his application of inappropriate rudder input. Contributing to the accident was the pilot's failure to follow the em ergency procedures for an engine failure during takeoff. Also contributing to the accident was the left engine power reduction for reasons that could not b

e determined because a postaccident examination did not reveal any anomalies that would have precluded normal operation and thermal damage precluded a complete examination.",

"The pilot's failure to maintain airspeed while maneuvering, which resulted in the airplane exceeding its critical angle-of-attack and experiencing an aerodynamic stall. Contributing to the accident were abnormal engine operation due to improper magneto-to-engine ignition timing and the pilot's failure to have the airplane inspected before the flight as required by the special flight permit.",

'A failure of the right engine magneto distributor drive gears, which resulted in a total loss of engine power during takeoff. Contributing to the accident was the operator's failure to inspect and maintain the magnetos in accordance with the engine manufacturer's specifications. \r',

"The pilot's engagement of the emergency parking brake during the landing roll, which decreased the airplane's braking performance and prevented it from stopping on the available runway. Contributing to the pilot's decision to engage the emergency parking brake was the expectation of a faster rate of deceleration and considerably shorter wet runway landing distance provided by the airplane flight manual than that experienced by the crew upon touchdown and an actual wet runway friction level lower than the assumed runway friction level used in the calculation of the stopping distances published in the airplane flight manual.\r\n\r",

"The pilot's failure to maintain adequate airspeed and his exceedance of the airplane's critical angle-of-attack for reasons that could not be determined based on the available evidence, which resulted in an aerodynamic stall/spin. Contributing to the accident was the improperly installed oil gauge housing extension, which resulted in a loss of oil quantity and right engine power.",

"The pilot's improper recovery from a bounced landing during gusty crosswind conditions.",

"The pilot's inadequate approach and excessive airspeed, which resulted in a long landing, the subsequent runway overrun, and impact with terrain. Contributing to the accident was the pilot's delay in aborting the landing.",

'The pilot's decision to descend below the recommended altitude during approach for landing in night visual meteorological conditions, and his failure to see and avoid a lighted tower, which resulted in collision with the tower and a subsequent total loss of engine power.\r',

"The pilot's misjudgment of his helicopter's position relative to a parked helicopter during a pedal turn.",

'The pilot's decision to continue flight below the minimum descent altitude without visually acquiring the runway and his delayed and improperly executed missed approach procedure in instrument meteorological conditions.',

'The loss of power to the right engine for reasons that could not be determined during postaccident examination and teardown and the pilot's failure to properly configure the airplane for single-engine flight.',

'The pilot's continued visual flight into instrument meteorological conditions which resulted in an inflight collision with terrain. Contributing to the accident was the pilot's inadequate preflight planning, during which he failed to identify forecasted deteriorating weather conditions along the route of flight.\x0b\x0b\r',

"The pilot's failure to maintain clearance with terrain that was along the planned route of flight.",

"The pilot's inadequate flare, which resulted in a hard landing.",

"The pilot's inability to transfer fuel from the aft auxiliary fuel tank to the main fuel tanks for reasons that could not be determined because the airplane was ditched and not recovered.\r\n\r",

'Maintenance personnel's improper installation of the engine data monitor (EDM), which was not in accordance with the supplemental type certificate instructions and resulted in engine warning indications and the pilot's subsequent reaction to the warning indications due to his lack of experience with the EDM and aircraft systems.'

e with the FDR and DPLR, which led to excessive brake temperatures and resulted in a right main landing gear brake fire.",

"The pilot's failure to conduct all of the required items on the Before Starting Engines checklist, which resulted in her failure to detect an open hydraulic circuit breaker and led to insufficient hydraulic pressure to operate the airplane's brakes, her subsequent loss of airplane control, and ground collision with an airplane.",

'The airplane encountered extreme turbulence during descent.',

"The left engine propeller's uncommanded travel to the feathered position during takeoff for reasons that could not be determined due to impact damage. Contributing to the accident was the flight crew's failure to establish a coordinated climb once the left engine was shut down and the left propeller was in the feathered position. \r\n\r",

"The pilot's failure to maintain directional control during a crosswind landing in gusting crosswind conditions.",

'The collapse of the nose and right main landing gears during landing for reasons that could not be determined because examination of the landing gear system revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.\r\n\r',

"The pilot's delayed decision to abort the takeoff after the airplane did not lift off as expected due to an inaccurate airspeed indication and tailwind condition, which resulted in a subsequent runway overrun.",

"The pilot failed to maintain control of the airplane while maneuvering to land resulting in contact with a power line and the ground. Contributing to the accident was the pilot's lack of familiarity with the airplane.",

'The failure of a spring inside the No. 2 brake\x92s upper brake control valve and the fracture of the coupling subassembly of the No. 1 wheel speed sensor during landing, which resulted in the loss of braking action, and the pilot-in-command\x92s (PIC) deactivation of the antiskid system even though there were no antiskid failure annunciations, which resulted in the rupture of the Nos. 1, 3, and 4 tires, further loss of braking action, and subsequent landing overrun. Contributing to accident were the PIC\x92s improper landing flare, which resulted in landing several hundred feet beyond the aiming point marking, and his unsuccessful attempts to deploy the thrust reversers for reasons that could not be determined because postaccident operational testing did not reveal any anomalies that would have precluded normal operation.\x0b\x0bContributing to the passenger\x92s injury was his leaving his seat intentionally while the airplane was in motion.\r',

"The pilot's failure to maintain a proper glidepath and failure to perform a go-around once a safe landing could not be accomplished, which resulted in a landing area overshoot and runway excursion.",

"The pilot's decision to land during unfavorable wind conditions, which resulted in a loss of control due to settling with power. Contributing to the accident were the lack of an adequate approach path due to numerous obstructions and the lack of available guidance regarding the helicopter's performance capabilities in the right quartering tailwind condition. \r\n\r",

'The loss of engine power during the go-around due to fuel contamination.',

"The pilot's improper fuel planning, which resulted in fuel exhaustion, and a loss of engine power en-route.",

"The pilot's failure to ensure that the airplane's landing gear was down and locked prior to touchdown.",

"The pilot's failure to maintain airplane control during a go-around in gusting tailwind conditions, which resulted in a collision with trees.",

'A blown nose landing gear tire during landing, which resulted in the pilot\x92s inability to maintain directional control.\r',

"The pilot's spatial disorientation during a low-level river crossing in rainy, gray, reduced visibility meteorological conditions, which resulted in the helicopter's subsequent descent and impact with the water. Contributin

g to the accident was the pilot's decision to attempt the low-level crossing under those meteorological conditions.\r",

'The in-flight failure of the cabin pressurization relief/safety valve (CPRV) due to an obstruction of the CPRV static port, which allowed the airplane to overpressurize. The reason for the initial overpressurization condition could not be determined.',

'the fracture of one 1st stage turbine blade from a high cycle fatigue crack that originated from a break in the coating on the leading edge of the blade. The cause for the break in the coating could not be determined. Contributing to the uncontained release of turbine material was the yielding and rupture of the turbine exhaust case wall after turbine debris collected at probes in the case.',

'Unknown maintenance personnel\x92s inadequate securing of a wiring bundle during a maintenance, repair, or modification event, which led to chafing of the wiring bundle, an electrical short and arcing, and a subsequent in-flight fire.\r',

"The pilot's failure to monitor the airplane's movement and maintain control of the airplane.",

"The pilot's failure to follow the Preflight checklist and his inadequate preflight inspection, during which he failed to detect the water contamination of the fuel, which resulted in a partial loss of engine power during initial climb.",

"The pilot's failure to extend the landing gear before landing.",

"The pilot's failure to see and avoid power lines while intentionally maneuvering at low altitude for the aerial observation flight.",

"The loss of engine power due to a malfunctioning magneto. Contributing to the accident was maintenance personnel's improper use of a drill bit instead of a timing pin during magneto installation, which resulted in a section of the drill bit breaking off and ultimately to the magneto failure.\r\n\r",

'The deliberate concealment and reuse of an unairworthy tail rotor driveshaft by unknown personnel, which resulted in an overstress separation at a bonded flange adapter as a result of driveshaft imbalance.',

"The pilot's inadequate preflight and mismanagement of the fuel supply, which resulted fuel exhaustion.",

'A total loss of engine power due to the failure of the No. 2 bearing, which resulted from a fractured separator.\r\n\r',

"The airplane's collision with a deer on the unfenced runway during the takeoff roll. Contributing to the accident is the airport's failure to establish a continuous fence between the runway and the nature conservancy.",

'The pilot\x92s improper burner control, which allowed the balloon\x92s envelope to cool, and the balloon\x92s subsequent encounter with a drop in wind velocity during a high\x1ewind landing approach, both of which resulted in the balloon\x92s descent rate increasing too rapidly for the pilot to arrest it and led to a hard landing.\r',

"Maintenance personnel's improper installation of the propeller governor, which resulted in damage to the governor drive gear and its subsequent failure and a subsequent loss of engine power.",

"The airplane's inability to takeoff for reasons that could not be determined because postaccident examination of the airplane revealed no anomalies. The aborted takeoff resulted in a runway overrun and impact with a fence.",

"The pilot's failure to maintain directional control during the takeoff roll, which resulted in a runway excursion and impact with terrain.",

"The pilot's selection of unsuitable terrain for takeoff, which resulted in a jammed elevator and subsequent loss of control and collision with terrain.",

"The pilot's inadequate compensation for wind conditions, and improper recovery from a bounced landing resulting in a loss of control and collision with terrain.",

"The flight crew's failure to properly use the before start checklist,

to monitor the airplane's motion, and to see and avoid objects around the airplane, which resulted in an inadvertent roll into a ground vehicle.",

"The pilot's improper decision to attempt flight with an unairworthy airplane and improper starting procedure that resulted in an uncontrolled take off without the pilot aboard. Contributing was the inoperative airplane battery/engine starter.",

"The flight crew's failure to visually ensure that the cabin door locking pin was in place before takeoff.",

"A failure of the helicopter's hydraulic flight control systems for reasons that could not be determined due to the fire damage, and the pilot's inability to turn off the hydraulic system to relieve control pressure.",

"The Captain's decision to taxi on a closed taxiway, which resulted in a collision with a parked construction vehicle. Contributing to the accident was a ground crew employee's decision to move barricades from the closed taxi way.",

'Oil starvation that led to the failure of the No. 5 connecting rod and a subsequent loss of engine power.',

"A loss of engine power due to a malfunction of the turbocharging system likely due to contaminated oil. Also causal were the pilot's decision to continue the takeoff although the airplane was not performing normally and his failure to maintain adequate airspeed following the loss of engine power, which resulted in the airplane exceeding its critical angle of attack and an aerodynamic stall. Contributing to the accident was the engine manufacturer's inadequate guidance regarding inspection and maintenance of its turbocharged engines.",

'The pilot\x92s improper decision to turn the helicopter toward a tail wind during an out-of-ground-effect hover, which resulted in a loss of tail rotor effectiveness. Contributing to the accident was the accident and lead pilots\x92 inadequate preflight risk management.\r\n\r\n',

"The pilot's descent below the published minimum descent altitude in night instrument meteorological conditions without visual contact with the runway environment, which resulted in a collision with trees and terrain short of the runway. Contributing to the accident were the pilot's acute fatigue and his decision to attempt an instrument approach procedure that was not authorized at night.",

'A bird strike.',

"The pilot's improper preflight performance planning, which resulted in a hard landing due to low rotor rpm while operating near maximum gross weight in high density altitude conditions.",

"The jet flight crew's use of an inappropriate checklist to resolve a parking brake hydraulic system pressure anomaly, which resulted in the airplane rolling down a slight incline and colliding with the parked twin-engine turboprop airplane. Contributing to the accident was the defective parking brake check valve.\r\n\r\n",

"The pilot's excessive use of brakes during the landing roll, which resulted in a nose over.",

"The pilot's selection of an unsuitable, off-airport site, which resulted in a nose over.",

"The pilot's failure to maintain directional control during the landing roll in windy conditions, resulting in a runway excursion and collision with a fence.",

'A loss of directional control during a water takeoff for reasons that could not be determined because the airplane was not examined due to the remote accident location.',

'A partial loss of engine power during cruise flight for reasons that could not be determined because postaccident examination of the airframe and engine did not reveal any anomalies that would have precluded normal operation.\r\n\r\n',

'The partial loss of right engine power for undetermined reasons with insufficient runway remaining for the aborted takeoff.',

"The pilot's failing to maintain yaw control during a go-around which

"The pilot's failure to maintain yaw control during a go-around, which resulted in a right main landing gear collapse and the right wing impacting terrain during a runway excursion.",

'The failure of the pilots to maintain control of the airplane while maneuvering, which resulted in an aerodynamic stall from which they did not recover.',

"The pilot's failure to maintain obstacle clearance during the takeoff, which resulted in the helicopter striking power lines.",

"The loss of right engine power on takeoff due to maintenance personnel's failure to properly tighten the crankcase through-studs during cylinder replacement, which resulted in crankshaft fracture. Also causal were the pilot's failure to feather the propeller on the right engine and his failure to maintain control of the twin-engine airplane while maneuvering to return to the airport.",

"The pilot's improper use of the trim, which created a cross-controlled situation and resulted in an aerodynamic stall during the attempted go-around.",

"The pilot's feathering of the incorrect propeller following a total loss of right engine power due to fuel starvation, which resulted from maintenance personnel's failure to reinstall the flapper valve in the right main fuel tank. Contributing to the accident was the pilot's impairment due to alcohol consumption.",

"The pilot's failure to maintain airplane control after encountering convective shower activity. Contributing to the accident was the pilot's decision to continue flight into an area of known adverse weather.",

"The pilot's delayed extension of the landing gear and his failure to ensure that the main landing gear (MLG) were down and locked before touchdown, which resulted in the collapse of both MLG. Contributing to the landing gear collapse was the mis-set landing gear warning horn, which prevented timely notification that the landing gear were not down and locked.",

"The pilot's failure to properly calculate the airplane's weight and balance and center of gravity, which resulted in the tail striking the ground.",

'A total loss of engine power during cruise flight due to fuel exhaustion. Contributing to the accident was the improper calibration of the fuel quantity gauge.',

"The pilot's failure to extend the landing gear before landing.\r\n\r\n",

"A partial loss of engine power shortly after takeoff due to an inadequately tightened fuel line. Also causal was the pilot's failure to extend the landing gear once the airplane was in a position to safely land on the runway.",

'The pilot's failure to maintain glide path, descent rate and landing flare, in off shore wind conditions, resulting in a hard landing short of the runway.',

'The pilot's failure to follow proper procedures in response to a crew alerting system warning for high engine torque values, which necessitated an off-runway emergency landing during which the airplane sustained substantial damage due to postimpact fire. Contributing to the accident was the erroneous engine torque indication for reasons that could not be determined.\r',

'The pilot's failure to cycle the surface deice boots during the instrument approach in icing conditions, which led to ice accumulation on the leading edges of the wings and empennage, and resulted in an aerodynamic stall and subsequent hard landing.\r',

"The pilot's inability to correct for a crosswind during the takeoff roll due to the interlinked flight control design, which resulted in a runway excursion, and a collision with terrain.",

'The pilot's failure to maintain the minimum-recommended approach airspeed in icing conditions, which resulted in a loss of airplane control. \r\n\r',

"The pilot's failure to maintain adequate airspeed while turning from

the base leg to final, which resulted in the wing's critical angle-of-attack being exceeded and a subsequent aerodynamic stall.",

"Maintenance personnel\x92s repeated failure to re-rig the main landing gear (MLG) in accordance with the airplane manufacturer's service manual requirements, which resulted in the collapse of the right MLG.",

'An unintentional collision with a white-tailed deer during the takeoff roll in night visual conditions.',

"The pilot's loss of airplane control during a missed approach in instrument meteorological conditions due to spatial disorientation. Contributing to the accident was the pilot's inadequate preflight and inflight weather planning which resulted the pilot's selection of an unsuitable alternate airport, and the Civil Air Patrol's inadequate flight release procedures and inadequate oversight of the flight.",

'Fatigue cracking of a main rotor blade for reasons that could not be determined based on the available information.\r\n\r',

"The pilot's inadequate compensation for wind during the landing approach, which resulted in the balloon\x92s basket impacting a metal fence and a passenger sustaining serious injuries.",

"The pilot's improper preflight fuel planning, which resulted in a total loss of engine power due to fuel exhaustion. Contributing to the severity of the pilot's injuries was his failure to have a properly secured shoulder harness at the time of the accident.",

'The pilots\x92 failure to use available sources of wind information before landing and recognize cues indicating the presence of the tailwind and conduct a go-around, which resulted in their landing with a significant tailwind and a subsequent runway overrun. \r',

'The Goodyear pilot did not see and avoid the Nakajima ahead on the taxiway.',

"The pilot's excessive descent rate while flaring during a practice autorotation with a power recovery, which resulted in an impact with terrain.",

'The pilot\x92s failure to extend the landing gear due to his distraction with the flaps, his misinterpretation of the landing gear warning horn, and his failure to verify that the landing gear were down, which resulted in a landing with the gear retracted. \r\n\r\n\r',

'The pilot\x92s failure to control the balloon\x92s descent rate during the landing approach, which resulted in a hard landing.\r',

"\r\n\r\nThe pilot's inability to return to the departure airport due to an unspecified in-flight emergency for reasons that could not be determined during a postaccident examination of the airplane.",

"The pilot's failure to use supplemental oxygen as required during high-altitude flight, which resulted in his loss of consciousness following a loss of cabin pressurization. Contributing to the accident was the separation of the air conditioning system's primary pressurization duct and the subsequent failure of the aft pressure bulkhead check valve flapper due to progressive weakening from age.",

"The flight instructor's delayed remedial action and his failure to remain vigilant as the helicopter entered the weathercock stability region, in gusting wind conditions, resulting in loss of tail rotor effectiveness and ground impact.",

'The pilots\x92 failure to maintain adequate control of the airplane during the initial climb after takeoff, which resulted in the airplane exceeding its critical angle of attack and an aerodynamic stall at a low altitude. Contributing to the accident was the operation of the airplane above its maximum takeoff weight at a high density altitude at the time of the accident.\r',

'The pilot\x92s failure to select the correct route through the mountains as a result of geographic disorientation, and his subsequent visual flight into instrument meteorological conditions, which resulted in collision with terrain.\r',

"The uncertificated pilot's failure to maintain pitch and directional control, which resulted in an impact with terrain and a rollover.",

'An encounter with turbulence due to updrafts and/or dust devils that resulted in mast bumping and an in-flight break-up.',

"Company maintenance personnel's inappropriate removal without replacement of the safety wires on the collective lever pin screws during a recent maintenance inspection, which resulted in the screws backing out and led to a loss of collective control in flight.",

'The overstress fracture of the left main landing (MLG) gear axle attachment bolts and the subsequent separation of the left MLG wheel, which resulted in the pilot's inability to control the airplane.\r\n\r',

'The pilot's exceedance of the airplane's critical angle of attack on short final approach, which resulted in an inadvertent aerodynamic stall and subsequent loss of control. Contributing to the accident was the pilot's distraction with other traffic in the area. \r',

"The pilot's pattern of poor decision-making that led to the initial launch, continued flight in fog and above clouds, and descent near or through clouds that decreased the pilot's ability to see and avoid obstacles. Contributing to the accident were (1) the pilot's impairing medical conditions and medications and (2) the Federal Aviation Administration's policy to not require a medical certificate for commercial balloon pilots.",

"The pilot's failure to maintain adequate airspeed during the initial climb after taking off from a wet runway and his exceedance of the airplane's critical angle of attack, which resulted in an aerodynamic stall.",

'An in-flight collision with a bird resulting in damage to a tail rotor blade, which required replacement.',

"The pilot's failure to ensure that the brake was fully engaged and his subsequent failure to notice that his airplane was rolling forward, which resulted in it hitting another airplane.",

"The pilot's exceedance of the critical angle of attack during the landing flare, which resulted in an aerodynamic stall and a hard landing.",

"The pilot's failure to attain a proper touchdown point, which resulted in the helicopter sliding off the aft end of the transport dolly.",

'Failure of the control rotor cuff due to fatigue. ',

"The pilot's encounter with a downdraft that exceeded the climb performance of the powered glider and resulted in his inability to maintain clearance from the trees. Contributing to the accident was the pilot's decision to fly near building clouds and rain shower activity.",

"The pilot's selection of a landing runway which, given the wind and traffic conditions, was susceptible to high crosswinds and the translation of wake turbulence across its approach path, and the controller's and pilot's failure to ensure separation from the B757 and its wake, which resulted in a low-altitude encounter with wake vortices that the pilot was unable to recover from. \r\n\r\n\r\n\r\n\r",

'The pilot's failure to adequately survey the area of operation and his subsequent failure to maintain clearance from power lines during an agricultural application flight.\r\n\r',

'The pilot's improper landing flare, which resulted in a hard landing.\r\n\r',

'The pilot's improper decision to land the airplane on a wet runway, in heavy rain, with tires worn beyond safe limits, which resulted in a hydroplaning condition and subsequent loss of directional control.\r',

'The pilot's selection of unsuitable terrain for an off-airport precautionary landing, which resulted in a nose-over. \r',

"The pilot's delayed action to add power during the approach, which resulted in an impact with terrain prior to the approach end of the runway.",

"The pilot's failure to maintain clearance from the ground obstacle during the landing with gusting winds present.",

"The pilot's improper landing flare, which resulted in a bounced, hard landing.",

"The pilot's failure to maintain directional control during the landing roll in shifting wind conditions.",

"The flight crew's failure to maintain an appropriate approach speed a

nd obtain an appropriate touchdown point on the runway, which resulted in a r unway overrun.\r",

'The failure of the nose landing gear down-lock piston to engage due t o paint accumulation, which resulted in a nose landing gear collapse during l anding. Also causal was the failure of the facility that performed the painting to comply with manufacturer guidance regarding painting of the airplane.',

'A total loss of engine power due to the failure of the intake valve i n the No. 3 cylinder for reasons that could not be determined based on the av ailable information. \r\n\r',

"The pilot's improper pitch and power control during landing in a stra ight float-equipped airplane on grass in crosswind conditions, which resulted in a loss of directional control.",

'The pilot\x92s improper compensation for changing wind during the lan ding flare, which resulted in an off-centered landing and a subsequent loss o f directional control. \r\n\r',

'A clamp rubbing a hole in a fuel drain line, which resulted in an eng ine compartment fuel leak and subsequent engine fire.',

"The pilot's improper engine start procedure, which resulted in a loss of control on the ground and collision with a tree.",

'The pilot\x92s failure to see and avoid the airplane stopped ahead of him during taxi. ',

'The pilot\x92s loss of directional control during the landing roll, w hich resulted in the runway excursion onto the rock-covered runway safety area. \r\n\r\n\r',

'The pilot\x92s failure to fly a stabilized approach and his inadequat e landing flare, which resulted in a hard landing. Contributing to the accide nt was the pilot\x92s failure to ensure that the airplane was properly servic ed with fuel before departing on the flight. \r',

"An in-flight collision with multiple birds, which resulted in separati on of the right engine's fan rotor and subsequent total loss of power of the right engine.",

'The decision of the maintenance facility mechanic to conduct maintena nce without reference to the applicable manufacturer\x92s guidance, which res ulted in the improper reassembly and subsequent failure of the engine compres sor bleed valve, which in turn prevented the engine from responding to furthe r power demand at a critical phase of flight. Contributing to the accident wa s the failure of the maintenance facility\x92s director of maintenance to ens ure that the overhaul was conducted properly and that the required post-maint enance test procedures were accomplished. \r',

'A partial loss of power during cruise flight for reasons that could n ot be determined because postaccident examination of the engines did not reve al evidence of any preimpact mechanical malfunctions or failures that would h ave precluded normal operation.',

'The airplane\x92s encounter with unforecast icing conditions, which l ed to structural icing that obscured the pilot\x92s vision, an aerodynamic stall, and a subsequent hard landing.\r',

'The pilot\x92s failure to maintain directional control during takeoff f.',

"The pilot's attempted landing on the ice-covered runway, which result ed in a runway excursion and impact with terrain. Contributing to the accident was airport personnel's lack of training regarding issuance of NOTAMs",

"The pilot's failure to ensure that the landing gear were down and loc ked before touchdown. Contributing to the accident was the pilot\x92s self-re ported fatigue at the time of the accident.",

'The pilot\x92s failure to remove the left helicopter skid tie-down be fore takeoff, which resulted in dynamic roll-over.\r\n\r',

'The pilot\x92s incapacitation from carbon monoxide poisoning in flight due to cracks in the exhaust muffler, which resulted in the airplane\x92s c ontinued flight until it ran out of fuel and its subsequent collision with te rrain.\r',

"The pilot's decision to hover-taxi out of the hangar and his subsequent failure to maintain clearance from the hangar.",

'The pilot\x92s delayed reaction to the balloon\x92s increased rate of descent during an attempted landing, which resulted in impact with a power line.\r',

'The pilot\x92s decision to fly in conditions conducive to structural icing and her subsequent failure to maintain airplane control during the instrument approach.',

'The pilot\x92s failure to properly deice the airplane before takeoff, which resulted in an aerodynamic stall during the initial climb. \r\n\r',

"The pilot's failure to maintain proper altitude resulting in a collision with water for reasons that could not be determined based on the available information.",

"The pilot's decision to take off with a gusting tailwind and his subsequent failure to maintain directional control.",

'The pilot\x92s decision to land with a crosswind that exceeded the airplane\x92s demonstrated capability, which resulted in the airplane banking left and the wing striking the ground. \r\n\r',

'The failure of the left main landing gear to fully extend for reasons that could not be determined because postaccident examination and testing did not reveal any evidence of preimpact mechanical failures or malfunctions that would have precluded normal operation.\r\n\r',

'The pilot\x92s failure to conduct a thru-flight walkaround inspection, which resulted in the engine cowling remaining open and subsequently separating from the helicopter and striking the main rotor blades and vertical stabilizer during departure.\r\n\r',

"Company maintenance personnel's failure to remove a screwdriver that was left lodged in the windshield wiper area of the forward fuselage during maintenance and subsequently became dislodged on takeoff/initial climb and collided with a left propeller blade.",

"The pilot's failure to maintain adequate airspeed while manually flying the airplane, which resulted in the airplane exceeding its critical angle of attack and experiencing an aerodynamic stall. Contributing to the accident was the pilot's inability control the airplane without the aid of the autopilot.",

'The pilot\x92s failure to maintain a proper descent rate during the approach, which resulted in a hard landing.\r\n\r',

'The pilot\x92s failure to maintain directional control of the airplane during the landing roll after encountering a dirt devil.\r\n\r',

'The malfunction of the right main landing gear actuator for reasons that could not be determined because postaccident examination revealed no mechanical anomalies that would have precluded normal operation. Contributing to the accident was the improper decision to disengage the landing gear system circuit breaker before the flight, which was contrary to the manufacturer-recommended procedures.',

"The pilot's failure to maintain control during landing, which resulted in an impact with terrain.",

'The pilot\x92s failure to maintain separation from a fence post during taxi at night.\r\n\r',

'The pilot\x92s failure to see and avoid power lines during landing.\r\n\r',

"The pilot's decision to fly into and land at an area of known widespread high gusting wind, which resulted in a nose-over.",

"The pilot's failure to maintain clearance from terrain while maneuvering at a low altitude. Contributing to the accident was the pilot's mistaken entry into a canyon surrounded by steep rising terrain while at a low altitude for reasons that could not be determined.",

"The pilot's failure to maintain directional control during the landing roll. Contributing to the accident were the pilot's lack of training and experience in the accident make and model airplane.\r\n\r\n\r\n\r",

The pilot-in-command's attempt to salvage an unstabilized visual approach, which resulted in an aerodynamic stall at low altitude. Contributing to the accident was the PIC's decision to allow an unapproved second-in-command to act as pilot flying, the PIC's inadequate and incomplete preflight planning, and the flight crew's lack of an approach briefing. Also contributing to the accident were Trans-Pacific Jets' lack of safety programs that would have enabled the company to identify and correct patterns of poor performance and procedural noncompliance and the Federal Aviation Administration's ineffective Safety Assurance System procedures, which failed to identify these company oversight deficiencies.",

'The ground crewman's failure to hold onto the passenger door while the main rotor was still rotating, which resulted in the door separating from the helicopter and damaging the main rotor.\r\n\r',

"The pilot's incorrect landing flare, which resulted in a hard, bounced landing.",

"The pilot's incapacitation due to scarring from previous heart attacks and severe hypertrophy of the left ventricular wall which resulted in arrhythmia and a loss of control while maneuvering at low altitude.",

"The pilot's inability to control the helicopter's descent after encountering a sudden wind shift to a tailwind while performing a near maximum gross weight landing at a high density altitude.\r\n\r\n\r\n \r\n\r",

'The pilot's failure to maintain directional control during the landing roll.\r\n\r',

'The pilot's failure to see and avoid transmission wires.\r\n\r',

'The pilot's improper landing flare, which resulted in a bounced landing, and his subsequent incorrect brake application, which led to the loss of directional control.\r',

'The pilot's loss of directional control during landing.\r\n\r',

"The loss of engine power and the subsequent pilot's loss of control for reasons that could not be determined because post-accident engine examination revealed no anomalies.",

"The pilot's failure to maintain adequate airspeed while maneuvering for landing, which resulted in an exceedance of the airplane's critical angle of attack and a subsequent stall/spin. Contributing to the accident was the pilot's distraction due to a failure with the airplane's electrical system, failure to follow emergency procedures and to continue with a known electrical problem. \r\n\r",

'The failure of the pilot to ensure that the flaps were set to the proper position for takeoff which resulted in the airplane becoming airborne and unable to climb or accelerate and subsequently impacting terrain. ',

"The pilot's failure to maintain helicopter control while maneuvering during takeoff.\r\n\r\n\r",

'The over-tensioning of the accessory belt, which resulted in damage to the starter adapter and subsequent loss of oil that led to oil starvation and catastrophic engine failure.\r',

"The pilot's improper landing flare, which resulted in a bounded landing and subsequent loss of directional control.",

"The pilot's improper landing in the tailwheel-equipped airplane, which allowed an excessive load on the tailwheel and resulted in the subsequent component fracture, loss of control, runway excursion, and impact with terrain.\r\n\r\n\r\n\r",

"The pilot's inadequate preflight inspection, which failed to detect a crack in the propeller blade, which led to the separation of a section of a propeller blade due to fatigue.",

'The pilot's inadequate in-flight fuel planning, which resulted in a loss of engine power due to fuel exhaustion.\r\n\r',

"The total loss of engine power due to oil starvation to the No. 1 connecting rod, which resulted from the improper torque of the No. 1 cylinder hold-down bolts and through-studs at the time of the cylinder's installation, which resulted in the failure of the connecting rod due to oil starvation. Contributing to the accident was the omission from the air traffic control disp

lay map data, of a closer alternate airport for the emergency landing.\r",

"The pilot's inadequate inflight decision making, which resulted in a total loss of engine power due to fuel exhaustion.",

"***This probable cause was modified on November 27, 2018. Please see the docket for this accident to view the original probable cause.*** \r\n\r\nThe pilot's improper decision to takeoff in an area of rough water and ocean swells, which resulted in a failure of the right float struts.",

'The pilot\x92s unstabilized approach while landing with a tailwind and his subsequent failure to go around, which resulted in a hard landing.\r\n\r',

'The fatigue failure of the aileron hinge bracket tubing for reasons that could not be determined based on the available evidence.',

"The failure of the bell crank pivot bolt which resulted in the left main landing gear collapse. Contributing to the accident was the lack of landing gear inspections in accordance with the airplane manufacturer's maintenance manuals.",

'The pilot\x92s failure to maintain pitch control of the airplane during landing, which resulted in a bounced landing. \r\n\r\n\r',

"The pilot's distraction by a cell phone during a low-altitude flight, which resulted in controlled flight into terrain.",

'A collective control malfunction for reasons that could not be determined.',

'an inadvertent encounter of clear air turbulence.',

'The pilot\x92s unstabilized approach, which resulted in a hard, bounced landing and nose-over. Also causal to the accident was the pilot\x92s improper decision to land on a closed alternate grass landing area.\r\n\r',

'The failure of the No. 4 connecting rod due to inadequate oil lubrication for reasons that could not be determined because the postaccident engine examination did not reveal any anomalies that would have caused a lack of lubrication.',

'The pilot\x92s excessive rudder and brake applications during landing, which caused the airplane to nose over.',

'The pilot\x92s failure to land the helicopter with both skids on the trailer platform, which resulted in a loss of control.\r\n\r',

'The pilot\x92s failure to maintain lateral control of the helicopter during takeoff, which resulted in dynamic rollover.\r\n\r',

"The flight crew's improper decision to land on a snow-covered runway that had insufficient runway distance for the airplane to land with the contamination, which resulted in a runway overrun and impact with obstacles. \r",

'Maintenance personnel\x92s failure to properly secure the tail rotor drive shaft cover, which resulted in the cover departing the helicopter in flight.\r',

'The pilot\x92s failure to apply carburetor heat during the approach, which resulted in a loss of engine power due to carburetor icing.\r\n\r\n\r',

"The pilot's inadequate preflight weather planning, which resulted in the flight over mountainous terrain into forecast instrument meteorological conditions, icing, and mountain wave, and resulted in an uncontrolled descent and collision with terrain. \r\n\r\n\r\n\r\n\r\n\r\n\r\n\r",

'The pilot\x92s failure to maintain directional control and her use of excessive braking during landing, which resulted in a nose-over. \r\n\r',

'The pilot\x92s failure to maintain clearance from a stationary helicopter during landing. Contributing to the accident was the ground crew\x92s failure to ensure that the helicopter would clear the stationary helicopter. \r\n\r\n\r',

'The failure of the left starter relay during engine start, which resulted in a loss of electrical and battery power during the flight and led to a forced landing with the nose landing gear not fully extended, causing substantial damage to the engines.',

"The pilot's mismanagement of fuel, which resulted in fuel exhaustion and descent and collision with trees.",

'A total loss of engine power due to fatigue failure of the crankshaft drive gear teeth. ',

'An in-flight control system flutter encounter during a turbulence encounter; the reason for the flutter could not be determined.',

'An in-flight loss of control for reasons that could not be determined based on the available evidence.',

'The pilot\x92s distraction due to her malfunctioning iPad, which led to her inadvertent forward cyclic application. \r',

'The pilot\x92s failure to maintain directional control during takeoff. Contributing to the accident was the pilot\x92s failure to properly check that the flight controls were correctly configured before takeoff. \r\n\r',

'The pilot\x92s improper preflight inspection of the fuel level, which resulted in a loss of engine power due to fuel exhaustion. Contributing to the accident was the pilot\x92s failure to lower the landing gear before the emergency landing.\r',

'The failure of the fuel selector valve in a nearly closed position, which resulted in a partial loss of engine power due to fuel starvation.',

'The airplane\x92s collision with deer during the landing roll. ',

"The passengers' failure to comply with the fasten seatbelt sign, which resulted in their injury during an inflight turbulence encounter.\r",

"The pilot's inadvertent selection of the fuel selector handle to the off position, which resulted in fuel starvation and a total loss of engine power.\r",

'The balloon pilot\x92s decision to add heat to the envelope with a tree branch protruding into the envelope that caught fire.\r\n\r',

'The pilot\x92s unstabilized approach, which resulted in the airplane landing long and fast, and the pilot\x92s subsequent decision to steer the airplane off the side of the runway to avoid a runway overrun.\r\n\r',

'The pilot\x92s selection of an unsuitable snow-covered airstrip for landing, which resulted in a nose-over.\r\n\r',

"A partial loss of engine power during cruise flight for reasons that could not be determined because postaccident examination did not reveal any mechanical malfunctions or failures that would have precluded normal operation. Contributing to the accident was the pilot's decision to continue flight instead of conducting a precautionary landing at nearby airports. \r\n\r\n\r",

'The failure of the left main landing gear upper arm forging due to fatigue cracking and subsequent overstress, which resulted in the collapse of the landing gear during the landing roll.\r',

"The pilot's loss of helicopter control as a result of fatigue during cruise flight at night.",

'The pilot\x92s failure to maintain adequate clearance from transmission power wires, which resulted in a tail rotor strike.\r\n\r',

"The pilot's failure to properly remove and secure the tie-down ropes during the preflight inspection, which resulted in the ropes becoming entangled in the rotor head swashplate and pitch control rods during flight and the subsequent loss of pitch control.\r\n\r",

'The pilot\x92s exceedance of the airplane\x92s critical angle of attack during a turn away from terrain, which resulted in an accelerated stall. Contributing to the accident was the pilot\x92s decision to delay the turn to avoid terrain. \r\n\r',

'The pilot\x92s failure to maintain sufficient altitude during approach in gusting crosswind conditions, which resulted in an attempted rejected landing and a runway undershoot. \r',

'The pilot\x92s failure to maintain a proper landing flare in gusting crosswind conditions.\r\n\r',

'The pilot\x92s failure to maintain directional control of the airplane during the landing roll. \r\n\r',

"The pilot's unsafe and aggressive operation of the helicopter at low altitude, which resulted in impact with trees.\r\n\r",

"The pilot's failure to maintain clearance from terrain for reasons that could not be determined based on the available information "

"The pilot's exceedance of the airplane's critical angle of attack, which resulted in an aerodynamic stall, spin, and subsequent impact with terrain.",

'A partial loss of engine power for reasons that could not be determined because postaccident engine examinations did not reveal any evidence of preimpact mechanical malfunctions or failures that would have precluded normal operation.',

"The pilot's encounter with atmospheric conditions that resulted in a loss of lift and a subsequent loss of control near terrain that precluded recovery. Contributing to the accident was the pilot's failure to follow the operator's published tour flight procedures regarding flight over the national park and minimum altitudes over and distance from terrain.",

"A loss of control due to spatial disorientation while climbing after departure in instrument meteorological conditions. Contributing to the accident was the pilot's lack of recent instrument experience.",

'The pilot\x92s improper decision to exit the helicopter without shutting down the engine, which allowed the collective/throttle to increase and resulted in a loss of control of the unattended helicopter.\r',

"The gunner's failure to ensure that the net would not ensnare the helicopter's skids once deployed, which resulted in the pilot being unable to maintain helicopter control as the bull pulled on the net and subsequent impact with terrain.",

'A total loss of engine power due to crankshaft failure as the result of a subsurface fatigue crack.',

'The pilot\x92s failure to retract the wheels of the amphibious airplane on takeoff, which resulted in a nose-over when the airplane landed on water with the wheels extended. Contributing to the accident was the pilot\x92s failure to use appropriate checklists. \r\n\r',

'An autopilot deviation during climb for undetermined reasons, which resulted in an in-flight upset and loss of airplane control. Contributing to the accident was the pilot\x92s failure to adequately monitor flight systems due to a distraction.\r',

"The pilot's failure to attain the proper touchdown speed and his decision to land with a tailwind without ensuring that there was adequate runway length for the touchdown.",

"The copilot's failure to maintain directional control during the initial takeoff roll and the pilot's failure to adequately monitor the copilot during the takeoff and his delayed remedial action, which resulted in the airplane briefly becoming airborne and subsequently experiencing an aerodynamic stall.\r",

'The airplane\x92s collision with a bird during approach.',

"The pilot's loss of control during a precautionary landing following an abnormal noise in-flight, the source of which could not be determined. \r\n\r",

'A collapse of the right main landing gear for reasons that could not be determined based on the available information. ',

'The airplane\x92s collision with a bird during approach.\r\n\r',

'The passengers\x92 fall from the basket after landing when the basket tipped over. ',

'The pilot\x92s failure to maintain adequate airspeed while maneuvering in the traffic pattern which resulted in an aerodynamic stall and subsequent spin at a low altitude, which the pilot was unable to recover from. \r',

"the drone pilot's decision to fly without pre-coordination, and without the requisite skills and knowledge, to maneuver the drone in close proximity to another aircraft.",

'The pilot\x92s failure to maintain directional control during takeoff in a crosswind.\r\n\r',

'The pilot\x92s unstabilized approach and hard landing, which resulted in a nose landing gear collapse.\r',

"The flight instructor's and pilot receiving instruction's failure to

maintain clearance from a tree while taxiing.",

"The pilot's failure to properly adjust the fuel/air mixtures, which resulted in a partial loss of engine power to both engines due to fuel starvation and a subsequent forced landing to a field. \r",

"The pilot's improper fuel management, which resulted in a total loss of right engine power due to fuel starvation; the pilot's inadequate flight planning; the pilot's failure to secure the right engine following the loss of power; and his failure to properly configure the airplane for the go-around, which resulted in the airplane's failure to climb, an exceedance of the critical angle of attack, and an aerodynamic stall.",

"The pilot's failure to verify that the emergency canopy release was in the correct position when opening the canopy during landing, which resulted in the canopy separating from the airplane and subsequently impacting the empennage. \r",

"The pilot's selection of an empty fuel tank for takeoff, which resulted in fuel starvation and the subsequent total loss of engine power.\r\n\r",

"The pilot's descent below minimum descent altitude during the nonprecision instrument approach for reasons that could not be determined based on the available information.",

"The pilot's attempt to move the helicopter from a sloped surface after an overspeed event, which resulted in a loss of helicopter control and impact with a car. The overspeed event resulted from misrouted and damaged wiring in the magneto, which subsequently resulted in errant and random signals to the governor.",

"The pilot's failure to correctly identify the runway environment during an instrument approach at night in instrument meteorological conditions because he mistook building lights for runway lights, which resulted in landing short of the runway. \r",

"The pilot's failure to maintain directional control during takeoff in a left quartering tailwind. ",

"The pilot's inadequate in-flight fuel management, which resulted in fuel starvation and the subsequent loss of engine power, and her subsequent failure to maintain clearance from trees during the approach to land at a nearby airstrip.\r\n\r\n\r\n\r",

"The pilot's delayed initiation of a go-around and his subsequent use of the improper go-around procedure, which resulted in a landing area overshoot.\r\n\r",

"The pilot's inadvertent landing gear retraction during the landing roll, which resulted in a canted left main landing gear and the wing dragging during the subsequent landing following a go-around.\r\n\r\n\r\n\r",

"The pilot's improper decision to conduct a low-level flight over a river, and his failure to see and avoid power lines, which resulted in the helicopter's impact with power lines and the water.",

"The pilot's failure to maintain control of the airplane in dark night conditions that resulted in an in-flight positive overload failure of the wings and the subsequent in-flight breakup of the airplane.",

"The mechanic's failure to properly secure the air reference line, which resulted in a loss of engine power. \r\n\r\n\r\n\r",

"Collision with terrain for reasons that could not be determined based on the available information. Contributing to the accident was the pilot's poor preflight planning and poor decision to depart on the accident flight.",

"The asymmetric deployment of the left wing load alleviation system for undetermined reasons, which resulted in an in-flight upset from which the pilot was not able to recover.\r",

"The pilot's failure to lower the flaps during the approach and maintain sufficient airspeed while flying in instrument meteorological and icing conditions and the accumulation of ice on the wings' leading edges, which resulted in the exceedance of the airplane's critical angle of attack and subsequent aerodynamic stall. Contributing to the accident was the pilot's lack of timely recognition of the developing stall condition and his failure to take corrective action in time to prevent the loss of control of the airplane.",

ack of proper qualification to operate the airplane under a single-pilot exemption due to his lack of total turbine time, which led to task saturation and his failure to properly configure the flaps for landing.\r",

"The pilot's improper preflight performance planning and his subsequent failure to attain sufficient speed for the airplane to climb with a tailwind.",

"The pilot's failure to maintain altitude during the hover operation while his view was obstructed due to the fogged-over windshield.",

'The airplane\x92s encounter with wind shear on short final approach to the runway, which resulted in a hard landing and fracture of the right main landing gear.\r\n\r',

'The loss of airplane control after an engine flameout and auto-feather system interruption during the takeoff climb, which resulted in an impact with terrain.',

'A loss of control for reasons that could not be determined based on the available information.',

"The flight crew's decision to continue an unstable approach under conditions that exceeded the airplane's landing performance capabilities, which resulted in a runway overrun and impact with terrain.\r",

"The pilot's failure to maintain a stabilized approach with a tailwind and his subsequent failure to maintain yaw control during an attempted go-around.\r\n\r\n\r\n\r",

'The pilot\x92s continued visual flight into instrument meteorological conditions associated with mountain obscuration conditions, which resulted in controlled flight into rising terrain. Contributing to the accident was the pilot\x92s failure to obtain a weather briefing. \r',

'The pilot\x92s failure to properly secure the crew hatch door before takeoff, which resulted in his distraction and his failure to maintain airplane control and airspeed.\r',

'The flight crew\x92s incorrect glidepath and flare to landing, which resulted in a landing area undershoot and the main landing gear\x92s collision with the runway threshold. \r',

'A landing gear collapse due to the separation of the actuator pinion bearing support from the actuator, which resulted in the failure of the actuator shaft. \r\n\r',

"The pilot's failure to maintain directional control during the landing roll in gusting wind conditions.",

"A loss of airspeed indication due to icing of the airplane's pitot probe, and the pilot's loss of control while maneuvering.\r\n\r",

"The pilot's inadequate preflight fuel planning and fuel management, which resulted in a loss of engine power due to fuel exhaustion. Also causal was the pilot's failure to follow the one-engine inoperative checklist and maintain the airplane's minimum controllable airspeed by properly configuring the airplane, which resulted in a loss of airplane controllability.",

'The airplane\x92s impact with a deer on the runway during takeoff.',

"The pilot's failure to maintain directional control during the landing roll, which resulted in a ground loop and subsequent nose-over.\r",

'A loss of engine power for reasons that could not be determined based on the available information.',

"The pilot's failure to compensate for adverse wind on final approach, which resulted in a loss of tail rotor effectiveness and aircraft control.\r",

'A loss of control due to an inflight right engine fire due to the loose fuel hose between the engine-driven fuel pump and the flow transducer.',

'The improper securing of the exhaust duct bolts, which resulted in the duct becoming unseated and substantial heat damage to the tail rotor drive shaft. \r',

'Impact with water for reasons that could not be determined based on the available information.',

'A total loss of engine power due to oil starvation as the result of the oil pressure switch failure due to a manufacturing defect '.

'The balloon\x92s encounter with rough terrain, which resulted in a bunced landing and a ground crewmember sustaining serious injuries.\r\n\r\n\r',

"The pilot's failure to maintain directional control during the landin g on a road in crosswind conditions, which resulted in the airplane exiting t he road and subsequently nosing over.\r",

'The improper maintenance of the outboard left wing, which allowed ele ctrical arcing and leaking of the fuel sending unit and subsequently resulted in ignition of fuel vapors and an explosion of the outboard left wing. \r\n\r',

"The pilot's failure to maintain the runway heading during an aborted takeoff, which resulted in a runway excursion and collision with a sign and t errain. Contributing to the need to abort the takeoff was the pilot's imprope r decision to take off with the airplane over its maximum gross takeoff weigh t.\r\n\r\n\r\n\r",

"The pilot's improper decision to operate the airplane in exceedance o f the airplane manufacturer\x92s operating limitations, which led to an aerod ynamic stall. Contributing to the accident was the pilot's improper decision to continue attempting the takeoff after two failed attempts.\r",

"The pilot's failure to maintain a proper approach path in gusting cro sswind wind conditions, which resulted in landing short of the runway and imp act with a ditch and runway light.\r\n\r\n\r\n\r",

"The pilot's failure to maintain a proper descent rate during landing, which resulted in a hard landing and a serious passenger injury.\r\n\r\n\r\n\r",

'The pilot\x92s impairment by medical conditions and/or medications, w hich resulted in the airplane\x92s impact with power lines and terrain.\r',

"The pilot's improper decision to fly over a river at a very low altit ude, which resulted in a collision with power lines.\r",

"The pilot's continuation of an unstabilized approach despite recogniz ing associated cues and the flight crew's decision not to initiate a go-aroun d before touchdown, which resulted in a bounced landing, a loss of airplane c ontrol, a landing gear collapse, and a runway excursion. Contributing to the accident was the pilot's failure to deploy the speedbrakes during the initial touchdown, which may have prevented the runway excursion, and the pilot's att empt to go around after deployment of the thrust reversers.",

"The pilot's failure to maintain adequate clearance from a tree while maneuvering at a low altitude.",

'A hard landing, which resulted the basket tipping over and a passenge r sustaining a serious injury.\r',

"The pilot's failure to maintain yaw and pitch control while repositio ning the helicopter, which resulted in dynamic rollover. \r\n\r\n\r\n\r",

'A propeller overspeed due to failure of the electronic ignition timin g ring attachment screws, and a runway overrun during the subsequent forced l anding. \r\n\r\n\r',

"The pilot's exceedance of the airplane\x92s critical angle of attack following a dual engine power loss caused by the line service technician fuel ing the airplane with the wrong fuel, which resulted in an aerodynamic stall and subsequent loss of control. Contributing was the pilot's inadequate super vision of the fuel servicing.\r",

"The pilot's failure to maintain lateral control while landing on glas sy water, which resulted in the left float touching the water, a loss of yaw control, and impact with a riverbank.\r\n\r\n\r\n\r",

"The pilot's improper flight planning and his subsequent failure to ma intain clearance from wires during takeoff.",

"The pilot's failure maintain clearance from power lines, which result ed in an explosion and preimpact fire.\r\n\r\n\r\n\r",

'The airplane\x92s in-flight collision with a bird.',

"The pilot's failure to follow the taxiway centerline guide and his di straction due to adjusting the radio, which resulted in his failure to mainta in clearance from a taxiway light after landing and while taxiing to a ramp.

\r",

"The pilot's failure to maintain proper clearance from a tractor trailer during landing.",

'The pilot\x92s loss of control shortly after takeoff in instrument meteorological conditions for reasons that could not be determined based on the available information.',

"The pilot's improper touchdown, which resulted in a hard landing and an overload failure of the right main landing gear leg and its associated shock/dampener.\r",

'The pilot\x92s failure to maintain the proper descent rate during the approach to landing, which resulted in a hard landing and serious injury to a passenger.\r',

"The pilot's failure to maintain a proper descent rate during landing, which resulted in a hard landing short of the runway.\r",

"The airplane hydroplaning while landing on a wet runway, which degraded its braking capability and resulted in a runway overrun onto grass and mud and the nose landing gear collapsing. Contributing to the accident was the pilot's improper decision to land the airplane until it was near the runway midpoint due to fog over the approach end of the runway.\r",

"The pilot's failure to maintain clearance from fencing around the landing pad during landing, which resulted in the tail rotor contacting the fence. \r",

"The pilot's failure to properly secure the crew hatch door before takeoff, which resulted in the door\x92s forward hinge assembly tearing from its fuselage mount point.\r",

'The pilot\x92s loss of directional control on the snow-covered runway, which resulted in a runway excursion.\r',

"The pilot's failure to maintain clearance from a fence during low-altitude maneuvering.\r\n\r\n\r\n\r",

"The pilot's failure to lock the tailwheel before landing, which resulted in his loss of directional control during the landing roll, a runway excursion onto soft ground, and a subsequent ground loop.\r\n\r\n\r\n\r",

"The pilot's failure to land and stop the airplane within the available runway, which resulted in a runway overrun. Contributing to the outcome was the pilot's inadvertent feathering of both propellers during approach to landing.\r",

"The pilot flying's improper lateral bank control during a go-around in gusting wind conditions, which resulted in the left-wing tip tank striking the runway.\r",

'A hard landing that occurred at an unknown time and date, which resulted in substantial damage that was identified prior to a subsequent flight. \r\n\r\n\r",

"The student pilot\x92s failure to maintain a stabilized approach and the flight instructor's delayed remedial action to initiate a go-around, which resulted in a runway overrun and impact with runway lights and fences.\r\n\r",

"The pilot's failure to maintain helicopter control in gusting wind that resulted in a loss in altitude and subsequent collision with a fence.",

"The pilot's failure to extend the landing gear during a precautionary landing after an electrical failure.",

'The mechanic\x92s failure to clean the oil suction screen during the most recent maintenance, which resulted in oil starvation and subsequent total loss of engine power. \r',

"The pilot's failure to maintain control of the airplane during the landing approach, which resulted in the airplane exceeding its critical angle of attack, an aerodynamic stall, hard landing, and a landing gear collapse.\r",

'The pilot\x92s failure to maintain directional control during landing, which resulted in the airplane exiting the runway and striking a ditch.\r',

the pilot did not maintain control of the airplane during the landing and subsequent go around.',

"The pilot's failure to maintain adequate clearance from a known obstacle while landing from a hover.",

'The balloon pilot\x92s inability to maintain altitude during un-forecasted weather, which resulted in a hard landing.\r',

'The balloon pilot\x92s inability to maintain the proper descent rate during the balloon\x92s approach to landing during un-forecasted weather, which resulted in a hard landing. \r',

'The pilot\x92s inability to arrest the descent rate when the balloon encountered unforeseen high ground wind that resulted in a hard landing. ',

"The pilot's failure to complete the pre-landing checklist due to a distraction which resulted in a gear-up landing.",

'The pilot\x92s loss of control during the landing flare, which resulted in an impact with trees.\r',

'The pilot\x92s failure to maintain helicopter control while hovering low over a body of water while facing into the sun, which resulted in a loss of visual reference and subsequent impact with the lake surface. \r',

'The airplane\x92s impact with a deer during takeoff.\r\n\r',

'The pilot\x92s failure to maintain sufficient altitude above terrain while operating in reduced visibility due to snow showers. ',

'A loss of directional control for reasons that were not determined due to lack of available evidence. ',

'The pilot\x92s failure to adequately monitor the environment which resulted in a collision with a snowbank and subsequent loss of control. ',

'The pilot\x92s loss of directional control during the back-taxi for departure in strong crosswind conditions which resulted in a runway excursion. Contributing to the accident was the snow-and-ice-covered runway. ',

"The pilot's misidentification of the airport\x92s active runway, which resulted in an off runway landing and a collision with a snow berm. Contributing to the accident was the runway\x92s lack of identifying markings. \r",

'The flying pilot\x92s failure to configure the flaps for a short field takeoff and delayed decision to abort the takeoff, which resulted in a runway overrun. \r',

'The pilot\x92s failure to visually inspect the runway condition before landing, which resulted in a collision with an ice chunk and main landing gear separation during landing. \r',

'An inadvertent collision with a bird during descent, resulting in substantial damage to the vertical stabilizer.\r',

'The pilot\x92s improper decision to conduct a low altitude flight and his failure to see and avoid powerlines. Contributing was the operator\x92s lack of safety guidance or a safety policy for low-altitude operations.',

'The pilot\x92s failure to extend the landing gear before landing. ',

'The pilot\x92s failure to maintain directional control during takeoff in gusting wind conditions which resulted in a loss of control and impact with terrain.',

'The pilot\x92s impact with a buoy on takeoff which resulted in a nose-over. ',

'The pilot\x92s failure to maintain airplane control during landing with a gusting crosswind which, resulted in a hard landing and collision with terrain.\r',

'The pilot\x92s failure to maintain adequate clearance from a parked helicopter while hovering to reposition for takeoff. ',

"The pilot's failure to maintain directional control during the landing roll ",

'The pilot\x92s failure to obtain a proper touch down location on a wet grass runway, resulting in a runway overrun and impact with terrain. \r',

'Overheating of two lithium batteries in the paramedic\x92s flight suit pocket resulting in an explosion and fire that seriously injured the paramedic as the helicopter was about to take off. ',

'The pilot\x92s failure to maintain stabilized lateral control during

landing in gusty conditions which resulted in a dynamic rollover when the skids contacted the platform unevenly. ',

'The pilot\x92s decision to land on the contaminated runway with previous reports of unfavorable braking action.',

"The pilot's failure to maintain a proper approach path in flat light conditions, which resulted in landing short of the runway and impact with terrain.\r",

'The pilot\x92s decision to continue visual flight into an area of instrument meteorological conditions, which resulted in the pilot experiencing a loss of visual reference and subsequent controlled flight into terrain.\r',

"The pilot's failure to maintain a proper approach path in flat light conditions, which resulted in landing short of the intended landing spot and impact with terrain. \r",

'The failure of the pilot of the second aircraft to maintain a safe distance from the lead airplane while taxiing, which resulted in a ground collision.\r\n\xA0\r',

'The airplane\x92s encounter with severe clear air turbulence that was not forecasted, which resulted in a serious injury to an unrestrained passenger. \r',

'The student pilot\x92s failure to maintain sufficient distance behind a jet airplane which, resulted in his loss of airplane control due to the jet airplane\x92s jet blast and the flight instructor\x92s delayed remedial action. \r',

'The pilot\x92s delayed go-around decision following an encounter with a tailwind during landing, which resulted in an inability to climb and subsequent impact with trees.\r',

'The pilot\x92s selection of unsuitable terrain for taxi which resulted in an impact with trees. ',

'The pilot\x92s failure to maintain directional control during takeoff in crosswind conditions which resulted in a loss of control and impact with terrain. ',

'The pilot\x92s failure to maintain sufficient clearance from the jet blast of a departing jet airplane.',

'The pilot\x92s inability to maintain control in high wind conditions while repositioning during a landing attempt, which resulted in a loss of control and collision with terrain. \r',

"The pilot's failure to attain a proper touchdown point which, resulted in a runway overrun and collision with trees. \r",

"The multi-engine pilot's failure to maintain clearance from another airplane during taxi.",

'The pilot\x92s failure to maintain directional control during takeoff in gusting wind conditions which resulted in a loss of control and impact with the water.',

'The pilot\x92s failure to extend the landing gear before landing. Contributing to the accident was the pilot\x92s failure to utilize a prelanding checklist. ',

'The malfunction of the braking system fluid line, which resulted in an overrun of the runway.\r',

'The pilot\x92s improper in-flight planning and fuel management that resulted in the loss of engine power due to fuel exhaustion.\r\n\xA0\r',

'The pilot\x92s excessive use of brakes which resulted in a nose-over. ',

'An in-flight collision with a bird.',

'The pilot\x92s inadequate visual lookout while flying at a low level over a river, which resulted in a wire strike.',

'The pilot\x92s failure to maintain control of the airplane during landing. []],

dtype=object)

c. Check the injury columns

The injury columns are most significant as they will be one of the determinants of the least risky aircraft from this dataset.

The injury columns are: 'Total.Fatal.Injuries', 'Total.Serious.Injuries', 'Total.Minor.Injuries' and 'Total.Uninjured'.

In [188...]

```
#Find the no. of missing values in the injury columns 'Total.Fatal.Injuries',
print(f"No. of Null values in 'Total.Fatal.Injuries' column are: {cleaned_av_
print(f"No. of Null values in 'Total.Serious.Injuries' column are: {cleaned_a
print(f"No. of Null values in 'Total.Minor.Injuries' column are: {cleaned_av_
print(f"No. of Null values in 'Total.Uninjured' column are: {cleaned_av_data[
```

```
No. of Null values in 'Total.Fatal.Injuries' column are: 299
No. of Null values in 'Total.Serious.Injuries' column are: 359
No. of Null values in 'Total.Minor.Injuries' column are: 356
No. of Null values in 'Total.Uninjured' column are: 151
```

The null values above likely indicate that there were no occurrences of the type of injury rather than that there are missing values. We can therefore replace this with (0) especially if we later choose to sum the injury columns per row.

In [188...]

```
#Replace the missing values in respective injury columns with 0
cleaned_av_data['Total.Fatal.Injuries'] = cleaned_av_data['Total.Fatal.Injuri
cleaned_av_data['Total.Serious.Injuries'] = cleaned_av_data['Total.Serious.In
cleaned_av_data['Total.Minor.Injuries'] = cleaned_av_data['Total.Minor.Injuri
cleaned_av_data['Total.Uninjured'] = cleaned_av_data['Total.Uninjured'].filln
```

In [188...]

```
#Confirm that there are no more missing values in respective columns
print(cleaned_av_data['Total.Fatal.Injuries'].isnull().sum())
print(cleaned_av_data['Total.Serious.Injuries'].isnull().sum())
print(cleaned_av_data['Total.Minor.Injuries'].isnull().sum())
print(cleaned_av_data['Total.Uninjured'].isnull().sum())
```

```
0
0
0
0
```

The injury columns now have no missing values

In [188...]

```
cleaned_av_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1611 entries, 58024 to 90327
Data columns (total 31 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   Event.Id         1611 non-null    object 
 1   Investigation.Type 1611 non-null    object 
 2   Accident.Number  1611 non-null    object 
```

```

3   Event.Date           1611 non-null  datetime64[ns]
4   Location             1611 non-null  object
5   Country              1611 non-null  object
6   Latitude             1538 non-null  object
7   Longitude            1539 non-null  object
8   Airport.Code          1010 non-null  object
9   Airport.Name          1020 non-null  object
10  Injury.Severity      1607 non-null  object
11  Aircraft.damage      1550 non-null  object
12  Aircraft.Category    1344 non-null  object
13  Registration.Number  1579 non-null  object
14  Make                 1611 non-null  object
15  Model                1611 non-null  object
16  Amateur.Built        1606 non-null  object
17  Number.of.Engines    1483 non-null  float64
18  Engine.Type          1387 non-null  object
19  FAR.Description      1354 non-null  object
20  Schedule              94 non-null   object
21  Purpose.of.flight    1611 non-null  object
22  Air.carrier           901 non-null  object
23  Total.Fatal.Injuries  1611 non-null  float64
24  Total.Serious.Injuries 1611 non-null  float64
25  Total.Minor.Injuries  1611 non-null  float64
26  Total.Uninjured       1611 non-null  float64
27  Weather.Condition     1525 non-null  object
28  Broad.phase.of.flight 377 non-null   object
29  Report.Status         1388 non-null  object
30  Publication.Date      1525 non-null  object
dtypes: datetime64[ns](1), float64(5), object(25)
memory usage: 402.8+ KB

```

... Further data exploration...

```
In [188... cleaned_av_data['Engine.Type'].unique()
```

```
Out[188... array(['Turbo Prop', 'Turbo Shaft', 'Reciprocating', 'Turbo Jet',
       'Turbo Fan', nan, 'Unknown', 'Electric', 'None', 'LR'],
      dtype=object)
```

```
In [189... cleaned_av_data['Injury.Severity'].unique()
```

```
Out[189... array(['Non-Fatal', 'Fatal(1)', 'Fatal(2)', 'Fatal(3)', 'Fatal(4)',
       'Incident', 'Fatal(8)', 'Fatal(7)', 'Fatal(9)', 'Fatal(6)',
       'Fatal(154)', 'Unavailable', 'Fatal(5)', 'Fatal', nan, 'Serious',
       'Minor'], dtype=object)
```

```
In [189... cleaned_av_data['Injury.Severity'].value_counts()
```

Non-Fatal	1176
Fatal	268
Fatal(1)	49
Fatal(2)	28
Incident	27
Fatal(3)	23
Minor	14
Serious	9
Fatal(4)	4

```
Fatal(7)      2
Fatal(8)      2
Fatal(9)      1
Fatal(154)    1
Fatal(6)      1
Fatal(5)      1
Unavailable   1
Name: Injury.Severity, dtype: int64
```

In [189...]: `cleaned_av_data['Injury.Severity'].value_counts().sum()`

Out[189...]: 1607

In [189...]: `cleaned_av_data['Injury.Severity'].isnull().sum()`

Out[189...]: 4

In [189...]: `cleaned_av_data.columns`

```
Out[189...]: Index(['Event.Id', 'Investigation.Type', 'Accident.Number', 'Event.Date',
       'Location', 'Country', 'Latitude', 'Longitude', 'Airport.Code',
       'Airport.Name', 'Injury.Severity', 'Aircraft.damage',
       'Aircraft.Category', 'Registration.Number', 'Make', 'Model',
       'Amateur.Built', 'Number.of.Engines', 'Engine.Type', 'FAR.Description',
       'Schedule', 'Purpose.of.flight', 'Air.carrier', 'Total.Fatal.Injuries',
       'Total.Serious.Injuries', 'Total.Minor.Injuries', 'Total.Uninjured',
       'Weather.Condition', 'Broad.phase.of.flight', 'Report.Status',
       'Publication.Date'],
      dtype='object')
```

d. Check the 'Aircraft.damage' column

The objectives indicate that the client would want aircraft that sustain the least amount of damage in any accident or incident such that it remained operational or repairable.

We will therefore clean and filter using this column.

In [189...]: `cleaned_av_data['Aircraft.damage'].unique()`

Out[189...]: `array(['Substantial', 'Destroyed', 'Minor', nan, 'Unknown'], dtype=object)`

In [189...]: `cleaned_av_data['Aircraft.damage'].value_counts()`

```
Out[189...]: Substantial    1216
Destroyed      253
Minor          76
Unknown         5
Name: Aircraft.damage, dtype: int64
```

In [189...]: `# Replace the 'Unknown' with 'NaN'`

```
cleaned_av_data['Aircraft.damage'].replace('Unknown', pd.NA, inplace=True)
```

In [189... # Check number of null entries

```
cleaned_av_data['Aircraft.damage'].isnull().sum()
```

Out[189... 66

In [189... # Drop null entries

```
cleaned_av_data = cleaned_av_data.dropna(axis=0, subset=['Aircraft.damage'])
```

```
#Check that there are no remaining null entries
cleaned_av_data['Aircraft.damage'].isnull().sum()
```

Out[189... 0

In [190... cleaned_av_data['Aircraft.damage'].value_counts()

Out[190... Substantial 1216
Destroyed 253
Minor 76
Name: Aircraft.damage, dtype: int64

e. Drop columns that are not relevant to our objectives

Going forward, the following columns are not relevant to our analysis based on the given objectives: 'Location', 'Country', 'Latitude', 'Longitude', 'Airport.Code', 'Airport.Name', 'Aircraft.damage', 'Registration.Number', 'FAR.Description', 'Schedule', 'Purpose.of.flight', 'Air.carrier', 'Weather.Condition', 'Broad.phase.of.flight', 'Report.Status', 'Publication.Date'.

We can drop them.

In [190... # List the columns to drop

```
columns_to_drop = ['Event.Id', 'Investigation.Type', 'Accident.Number', 'Loca
```

```
#Drop non-relevant columns and assign relevant columns to variable 'rel_av_dat
rel_av_data = cleaned_av_data.drop(columns=columns_to_drop)
```

In [190... #Check that the relevant columns appear under the variable 'rel_av_data'

```
rel_av_data.columns
```

Out[190... Index(['Event.Date', 'Injury.Severity', 'Aircraft.damage', 'Aircraft.Category',

```
'Make', 'Model', 'Amateur.Built', 'Number.of.Engines', 'Engine.Type',
'Total.Fatal.Injuries', 'Total.Serious.Injuries',
'Total.Minor.Injuries', 'Total.Uninjured'],
dtype='object')
```

I. Check II amateur or professional aircraft.

In [190...]

```
#Check unique attributes in this column
rel_av_data['Amateur.Built'].unique()
```

Out[190...]

```
array(['No', nan, 'Yes'], dtype=object)
```

The purpose of the new business endeavour is for commercial or private enterprise, not as a hobby or research and development purposes. We can therefore remove data on amateur built aircraft or equipment.

In [190...]

```
rel_av_data = rel_av_data[rel_av_data['Amateur.Built'].isin(['No'])]
```

In [190...]

```
#Check no. of entries(rows) remaining under each column
rel_av_data.count()
```

Out[190...]

Event.Date	1502
Injury.Severity	1501
Aircraft.damage	1502
Aircraft.Category	1262
Make	1502
Model	1502
Amateur.Built	1502
Number.ofEngines	1400
Engine.Type	1312
Total.Fatal.Injuries	1502
Total.Serious.Injuries	1502
Total.Minor.Injuries	1502
Total.Uninjured	1502

dtype: int64

In [190...]

```
#Check for duplicates in new data set
rel_av_data.duplicated().sum()
```

Out[190...]

```
1
```

In [190...]

```
# Drop duplicates and check if successful
rel_av_data = rel_av_data.drop_duplicates()
rel_av_data.duplicated().sum()
```

Out[190...]

```
0
```

g. 'Aircraft.damage' column

Earlier, we viewed and cleaned the 'Aircraft.damage' column. The objective is to find the least risk aircraft, we should focus on data on aircraft that got minor damage in the accidents and incidents.

In [190...]

```
# Filter to ensure that remaining data only contains incidents where aircraft
rel_av_data = rel_av_data[rel_av_data['Aircraft.damage'].isin(['Minor'])]
```

In [191...]

```
rel_av_data.info() #View info on remaining data

<class 'pandas.core.frame.DataFrame'>
Int64Index: 75 entries, 58182 to 89318
Data columns (total 13 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   Event.Date       75 non-null     datetime64[ns]
 1   Injury.Severity 74 non-null     object  
 2   Aircraft.damage  75 non-null     object  
 3   Aircraft.Category 61 non-null     object  
 4   Make              75 non-null     object  
 5   Model             75 non-null     object  
 6   Amateur.Built    75 non-null     object  
 7   Number.of.Engines 65 non-null     float64 
 8   Engine.Type      63 non-null     object  
 9   Total.Fatal.Injuries 75 non-null     float64 
 10  Total.Serious.Injuries 75 non-null     float64 
 11  Total.Minor.Injuries 75 non-null     float64 
 12  Total.Uninjured   75 non-null     float64 
dtypes: datetime64[ns](1), float64(5), object(7)
memory usage: 8.2+ KB
```

2. Collate and Group injuries data

After initially exploring the data set, initial cleaning and getting the data that will be relevant toward our objectives, we can now group this data based on injury columns to further understand the data.

In [191...]

```
# Collate data on injuries by make_model to a new data frame
injury_data = rel_av_data[['Make', 'Model', 'Total.Fatal.Injuries',
                           'Total.Serious.Injuries', 'Total.Minor.Injuries',
                           'Total.Uninjured']].copy()

injury_data.head()
```