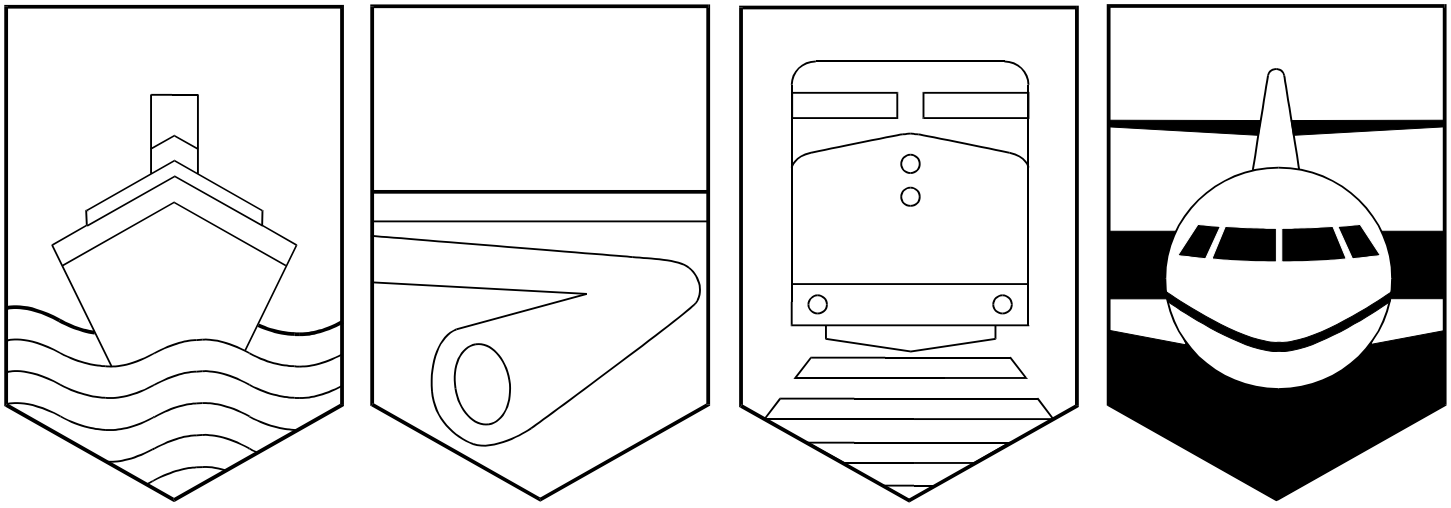
Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada



AVIATION OCCURRENCE REPORT

RUNWAY OVERRUN

LIGNUM LTD.
MITSUBISHI MU-300 DIAMOND C-GLIG
JASPER-HINTON AIRPORT, ALBERTA
01 MARCH 1995

REPORT NUMBER A95W0034

Canada

MANDATE OF THE TSB

The Canadian Transportation Accident Investigation and Safety Board Act provides the legal framework governing the TSB's activities. Basically, the TSB has a mandate to advance safety in the marine, pipeline, rail, and aviation modes of transportation by:

- conducting independent investigations and, if necessary, public inquiries into transportation occurrences in order to make findings as to their causes and contributing factors;
- reporting publicly on its investigations and public inquiries and on the related findings;
- identifying safety deficiencies as evidenced by transportation occurrences;
- making recommendations designed to eliminate or reduce any such safety deficiencies; and
- conducting special studies and special investigations on transportation safety matters.

It is not the function of the Board to assign fault or determine civil or criminal liability. However, the Board must not refrain from fully reporting on the causes and contributing factors merely because fault or liability might be inferred from the Board's findings.

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Aviation Occurrence Report

Runway Overrun

Lignum Ltd.

Mitsubishi MU-300 Diamond C-GLIG

Jasper-Hinton Airport, Alberta

01 March 1995

Report Number A95W0034

Synopsis

The Mitsubishi MU-300 Diamond business jet was on an instrument flight rules flight, from Williams Lake, British Columbia, to Hinton, Alberta. There were two pilots and two passengers on board. While on a visual straight-in approach to runway 02 at the Jasper-Hinton Airport, the crew encountered light turbulence and subsiding air. The captain increased the aircraft's speed from 105 to 115 knots on final approach, and the aircraft touched down about 1,000 feet down the runway at 110 knots. The captain first applied maximum braking and then, when he determined that the aircraft would not come to a stop in the remaining runway distance available, he initiated commanded swerving to assist in stopping the aircraft; the aircraft skidded to a position 255 feet off the end of the runway. The aircraft sustained substantial damage; however, the occupants were uninjured.

The Board determined that the aircraft overran the runway because the crew landed with a 14- to 21-knot tail wind. Contributing to the occurrence were the crew's belief that the calm winds given to them by the Area Control Centre for Jasper townsite were for the Jasper-Hinton Airport, and their decision to continue with the straight-in approach procedure without overflying the airport.

Ce rapport est également disponible en français.

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1.0 Factual Information

1.1 History of the Flight

The Mitsubishi MU-300 Diamond business jet was on an instrument flight rules (IFR) flight from Williams Lake, British Columbia, to Hinton, Alberta. There were two pilots and two passengers on board. Prior to issuing the descent clearance from flight level 270 (FL270), the Edmonton Area Control Centre (ACC) advised the crew of the Jasper townsite, Alberta, weather. The winds were reported as calm. The crew cancelled the IFR during the descent and continued for a visual approach and landing to runway 02 at the Jasper-Hinton Airport. During the approach, the crew encountered moderate turbulence on short final. The captain increased the reference airspeed (V_{ref}) from 105 to 115 knots to allow for subsiding air and airspeed fluctuations. The crew noted that the wind sock for runway 02 was fully extended and was varying in direction frequently. They elected to continue the approach and landing on runway 02. Power was reduced to idle at 50 feet. The aircraft touched down at about 1,000 feet down the runway. During the landing roll, the captain first applied maximum braking and then, when he determined that the aircraft would not come to a stop in the remaining runway distance available, he initiated commanded swerving to assist in stopping the aircraft; the aircraft skidded to a position 255 feet off the end of the runway. The aircraft sustained substantial damage; however, the occupants were uninjured.

The accident occurred at latitude 53 °19'N, longitude 117 °45'W, at an elevation of 4,016 feet above sea level (asl), at 0920 mountain standard time (MST), during the hours of daylight.

1.2 Injuries to Persons

	Crew	Passengers	Others	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	2	2	-	4
Total	2	2	-	4

1.3 Damage to Aircraft

The aircraft sustained substantial damage.

[1] See Glossary (Appendix A) for all abbreviations and acronyms.

[2] Units are consistent with official manuals, documents, reports, and instructions used by or issued to the crew.

[3] All times are MST (Coordinated Universal Time [UTC] minus seven hours) unless otherwise stated.

1.4 Other Damage

Slight environmental damage occurred when several hundred pounds of jet fuel leaked onto the ground from a punctured wing fuel tank. A municipal fire truck was used to apply foam to the aircraft and fuel-drenched soil several hours after the occurrence.

1.5 Personnel Information

1.5.1 General

	Captain	First Officer
Age	47	48
Pilot Licence	ATPL	ATPL
Medical Expiry Date	01 Jul 95	01 Jul 95
Total Flying Hours	3,500	13,500
Hours on Type	360	350
Hours Last 90 Days	50	63
Hours on Type Last 90 Days	50	63
Hours on Duty Prior to Occurrence	3.5	3.5
Hours Off Duty Prior to Work Period	13	48

1.5.2 Captain's History

The captain holds an Airline Transport Pilot Licence (ATPL) with an Aeroplane Class 1, Group 1 instrument rating. He has a Single, Multi-Engine Land and Sea (SMELS) rating, with Cessna 500 and Mitsubishi MU-300 endorsements. His last Class 1 aircrew medical was on 29 December 1994, valid to 01 July 1995. The only restriction is that corrective eye glasses must be worn. The captain successfully completed his pilot proficiency check (PPC) in January 1995. He had flown into the Jasper-Hinton Airport once previously, several months before this occurrence. He is also the chief engineer for Lignum Air, and performs all routine maintenance on their aircraft.

1.5.3 First Officer's History

The first officer (co-captain) holds an ATPL with an Aeroplane Class 1, Group 1 instrument rating. He has a SMELS rating, with Cessna 500, Mitsubishi MU-300, and Hawker-Siddeley HS25 endorsements. His last Class 1 aircrew medical was on 02 December 1994, valid to

[4] Estimated hours on type

01 July 1995. His only restriction is that corrective eye glasses must be available. The first officer successfully completed a PPC, as a captain, in January 1995. He had flown into the Jasper-Hinton Airport several months prior to this occurrence. He is the chief pilot for Lignum Air.

1.6 Aircraft Information

Manufacturer	Mitsubishi Heavy Industries Ltd.
Type	MU-300
Year of Manufacture	1984
Serial Number	A0076SA
Certificate of Airworthiness (Flight Permit)	Valid
Total Airframe Time	3,290.2 hr
Engine Type (number of)	Pratt & Whitney JT15D-4D (2)
Propeller/Rotor Type (number of)	N/A
Maximum Allowable Take-off Weight	15,500 lb
Recommended Fuel Type(s)	Commercial Kerosene, Jet A, Jet A1, Jet B, JP4
Fuel Type Used	Jet B

1.6.1 Additional Aircraft Information

The twin-engine business jet was imported into Canada in 1993 by Lignum Air. The aircraft had been previously modified in the United States in accordance with the Branson Aircraft Corporation Supplemental Type Certificate No. SA3891NM, on 03 June 1989. This modification increased the gross take-off weight from 14,700 to 15,500 pounds. The aircraft was not equipped with thrust reversers, nor is it required to be by regulations.

Weight and balance calculations determined that the aircraft weight was 13,000 pounds at the time of the occurrence. The centre of gravity (C of G) was 22.45 per cent mean aerodynamic chord (MAC). Both the weight and the C of G were within prescribed limits. The maximum authorized landing weight, with 30 degrees of flap, is 13,200 pounds. The factory-specified maximum tail wind component for take-off or landing is 10 knots. Maximum anti-skid braking must be used to achieve the charted stopping distances. The use of anti-skid braking will provide a consistently shorter landing roll for all runway conditions.

The aircraft records/logs indicate that the aircraft was certified and maintained in accordance with the existing regulations and approved procedures. It was reported that the aircraft was serviceable, with no identified or deferred deficiencies, on departure from Williams Lake.

1.6.2 Aircraft Flight Planning and Performance Data

On the day prior to the occurrence flight, the crew consulted the aircraft flight manual and determined that the aircraft could safely take off and land at the Williams Lake and Jasper-Hinton airports. During a pre-flight weather briefing, the Vancouver Flight Service Station (FSS) provided the crew with the Jasper townsite weather. The crew's destination, however, was Jasper-Hinton Airport.

1.7 Meteorological Information

The Environment Canada weather for Jasper townsite at 0900 MST was 20,000 feet thin scattered, visibility 25 miles, winds from 210 degrees True at two knots, temperature minus 21 degrees Celsius, and dew point minus 23 degrees Celsius. The Jasper townsite weather office is about 30 nautical miles (nm) from the Jasper-Hinton Airport, and 7 nm from the Jasper airstrip. The weather office is behind 8,000-foot-high mountains. The weather from the Jasper townsite weather office is readily available to the public, flight crews, and the Edmonton ACC.

At the Jasper-Hinton Airport, the automated weather observation system (AWOS) reported that the 0920 MST winds were from 200 degrees magnetic at 14 gusting to 21 knots. The temperature and dew point were minus 16.7 and minus 21 degrees Celsius, respectively. The altimeter setting was 30.30 inches of mercury. The AWOS weather is recorded and stored every 20 minutes, and reported to the Environment Canada weather office in Grande Prairie, Alberta, by the airport manager twice daily, usually at 0700 and 1500 hours. A review of the recorded winds showed that they had been out of the southwest for several hours prior to the occurrence. The AWOS weather can be obtained by telephone through an automated voice sequence; however, the telephone numbers are not generally known to the aviation public, or the Edmonton ACC. Weather information for the Jasper-Hinton Airport is not available from ATC or an FSS.

1.8 IFR Procedures Jasper-Hinton Airport

In accordance with section 471.2 of the Transport Canada *Air Traffic Control* (ATC) *Manual of Operations* (MANOPS) and Air Navigation Order (ANO) Series V, No. 16, the Edmonton ACC passed the nearest official weather (Environment Canada weather office at Jasper townsite) and altimeter setting to the crew when they were still in controlled airspace at FL270, prior to the descent into the Jasper-Hinton Airport. At approximately 0911 MST, after descending below 18,000 feet, the flight was cleared out of controlled airspace. The crew cancelled IFR when descending the aircraft through 16,000 feet and did not change to a visual flight rules (VFR) flight plan, nor were they required to do so. However, without a flight plan, ATC flight following is not guaranteed.

1.9 Jasper-Hinton Aerodrome Information

1.9.1 General

The Jasper-Hinton Airport is operated by the Alberta Transportation Department. It has one 4,500-by-100-foot asphalt runway, oriented on 020/200 degrees magnetic. The reference point elevation is 4,026 feet asl. An early morning inspection, carried out by airport staff prior to the occurrence, revealed that the runway was dry and bare. This airport is located in the designated mountainous region. Because of the unpredictable variable winds, the airport has three wind direction indicators: one at each end of the runway, and a lighted indicator situated about mid-field. The prevailing westerly winds are generally stronger at the Jasper-Hinton Airport because of the funnelling effect of the mountainous valley to the west. Subsiding air from the mountains to the west of the Jasper-Hinton Airport is generally present, especially with a westerly wind. The airport is uncontrolled, and often unmanned. At the time of the occurrence, there was no one operating the airport radio.

1.9.2 Jasper-Hinton Runway Data

The *Canada Air Pilot* (CAP) shows that the Jasper-Hinton runway 02 threshold elevation is 4,025 feet asl, and slopes down to 4,006 feet asl at the threshold of runway 20. The first 400 feet has a very slight upslope, then the remainder of the runway has a downslope varying from 1.0 per cent to 0.36 per cent. A downslope increases the landing distance of an aircraft.

1.9.3 Jasper and Jasper-Hinton Airport Name/Location Exchange

The Jasper Airport is operated by the federal government and is located within the Jasper National Park, about 23 nm from the Jasper-Hinton Airport.

The Jasper-Hinton Airport is operated by the provincial government and is remotely located about 9.5 nm southwest of the town of Hinton. Because of the locations and surrounding terrain applicable to each airport, the winds and weather may vary considerably.

The Alberta Transportation Department constructed the Hinton airport in the Hinton area to service both Hinton and Jasper. This airport would be of suitable size and equipped to handle most turbo prop and business jet aircraft. Because this airport was built to accommodate both the Jasper and Hinton traffic, it was named the Jasper-Hinton airport. The Hinton location was chosen because it would be nearly impossible to plan an instrument approach procedure within the confines of the mountainous terrain at the Jasper Airport. The Jasper Airport is also within a National Park.

1.10 Flight Data/Cockpit Voice Recorders, and Emergency Locator Transmitter

The aircraft was not equipped with a flight data recorder (FDR). A cockpit voice recorder (CVR) was installed; however, it had been deactivated by the company because it caused a feedback noise in the pilot's headsets. Neither the FDR nor the CVR was required by regulation; however, the International Civil Aviation Organization (ICAO) has made recommendations that all turbine-powered airplanes be equipped with these recording devices. The accuracy and quality of this investigation would have been enhanced by the availability of FDR and CVR data.

The aircraft was not equipped with an emergency locator transmitter (ELT) as required by Air Navigation Order, Series II, No. 17, the *ELT Order*. This ANO states that no person shall operate an aircraft in Canada or a Canadian aircraft outside Canada unless it is equipped with one or more serviceable ELTs. An aircraft need not be equipped with an ELT if the aircraft is "a multi-engine turbo-jet aeroplane of more

than 12,500 pounds (5,700 kilograms) maximum certificated take-off weight that is being operated (i) over land under IFR within controlled airspace, and (ii) south of latitude 66°30'N."

The ELT was not installed when the aircraft was imported into Canada because of the exemptions provided in the applicable ANO. In this case, when cleared out of controlled airspace on the descent below 18,000 feet, and upon cancellation of the IFR flight plan, the flight no longer met the conditions of the exemptions.

1.11 Wreckage and Impact Information

Evidence of the initial touchdown and main wheel tire spin-up marks was located at about 900 feet from the runway 02 threshold for the left-hand tire, and at about 1,070 feet for the right-hand tire. The nose wheel was lowered and braking applied, as evidenced by the skid marks starting at 1,350 feet for the left main wheel and 1,400 feet for the right main wheel. The main wheel tire skid marks were then continuous, but varying in intensity, until the aircraft came to rest. The uneven skid patterns indicate that brake anti-skid modulation occurred. A nose wheel skid mark occurred at 1,900 feet. Skid patterns indicate that the aircraft commenced a series of "S" turns about 2,950 feet from the threshold, and continued until the end of the runway. The captain used a swerving technique because he believed that it would most likely increase the chance of stopping the aircraft on the runway, since, by swerving, the aircraft would travel a greater distance to the end of the runway. It is unknown whether this procedure increases the likelihood of an aircraft stopping on the runway.

The aircraft came to rest about 255 feet beyond the pavement on a heading of 112 degrees magnetic. The nose wheel and left main landing gear had collapsed. The right main gear was damaged. All tires appeared to be intact and inflated. There were numerous wrinkles in the fuselage skin and structure, and the left wing lower skin had been scraped and punctured.

1.12 Fire

There was no evidence of fire either before or after the occurrence. Emergency Response Service (ERS) is not available at the Jasper-Hinton airport, although the local fire department will respond from Hinton, if requested.

1.13 Survival Aspects

There were no injuries to the crew, or to the passengers. The crew had not utilized the available shoulder harnesses. They reported that the installed harnesses restricted their movements.

1.14 Airmanship/Pilot Decision Making

The crew carried out a visual straight-in approach and landing to the Jasper-Hinton Airport. They cancelled IFR at 16,000 feet, and did not refile or change to a VFR flight plan; therefore, they were not on a "flight plan" during the descent and landing. They were, however, on a company flight itinerary throughout the flight, with company personnel in Vancouver being aware not only of who was on board, but of all departure and arrival times for the aircraft.

The *Aeronautical Information Publication (AIP) Canada*, "Aircraft Operations - Uncontrolled Aerodromes," describes the recommended procedures to be carried out by VFR aircraft at uncontrolled aerodromes. Section 4.5.2, "Traffic Circuit Procedures - Uncontrolled Aerodromes" describes the recommended procedure to be followed to join the circuit for a landing. Where pilots lack any necessary information, they are expected to make a visual inspection. Pilots should determine the wind and verify that the runway is unobstructed before landing. The Jasper-Hinton aerodrome has an aerodrome traffic frequency (ATF) of 123.2 MHz; however, this aerodrome is not always attended, and the ATF is not always monitored. At the time of this occurrence, the aerodrome was not attended and the ATF was not monitored.

2.0 Analysis

2.1 General

The aircraft was considered to be both mechanically serviceable and suitable for the intended flight. The crew was current on the aircraft, and had flown into the Jasper-Hinton Airport before. Although the runway used by the crew has a slight downslope, it was bare and dry, and of suitable length for the landing. Therefore, the analysis will concentrate on the decision-making factors that contributed to this occurrence, in particular the reasons why the crew opted to carry out a straight-in approach. The confusion between the Jasper townsite and Jasper-Hinton Airport weather reports will also be discussed.

2.2 The Jasper Townsite and Jasper-Hinton Weather Reports

The Jasper and the Jasper-Hinton airports are located close to each other and have similar names. When the crew was given the weather by ATC, they were given the Jasper townsite weather and winds. However, since the crew's destination was the Jasper-Hinton Airport, they believed that ATC had abbreviated the name, and that the information was for the Jasper-Hinton Airport. Thus, when advised by ATC that the Jasper wind was calm, the crew relied on weather information for the wrong airport. This confusion between the two airports was seen earlier, when the crew received a pre-flight weather briefing from the Vancouver FSS. They were given the weather for Jasper, which they interpreted as being for the Jasper-Hinton Airport, their destination. With this misinterpreted information in place, they elected to conduct a straight-in approach.

2.3 Pilot Decision Making

A straight-in approach for a landing is not recommended at uncontrolled airports where Air-to-Ground Advisory is not available to provide the wind, weather, and runway condition reports required to conduct a safe landing. Where pilots lack any necessary information for landing, they are expected to make a visual inspection by overflying the airport. They should determine the wind and verify that the runway is unobstructed before proceeding for a landing.

The crew understood that the winds at Jasper-Hinton were calm, they could see that the runway was clear of other traffic, and they were also monitoring the airport radio and other traffic. The crew, therefore, did not feel that it was necessary to join the circuit and conduct a visual inspection of the field prior to landing. The presence of the surface wind was not known to the crew until they were on short final, when they observed the windsock extended parallel to the ground and varying in direction frequently.

The crew had increased the V_{ref} speed by about 10 knots to compensate for subsiding air, turbulence, and airspeed fluctuations experienced on the approach. The touchdown occurred on the first quarter of the runway; however, the higher-than-normal approach speed, combined with a downsloping runway and 14-knot, gusting to 21-knot, tail winds, resulted in an unusually high ground speed at touchdown. Consequently, the crew was unable to stop the aircraft within the available runway distance.

The uneven skid patterns indicate that brake anti-skid modulation occurred several times, suggesting that the anti-skid system was functioning normally. The captain, after judging that the aircraft would not stop in the runway distance remaining, believed that he could

increase the chance of stopping on the runway by swerving the aircraft down the runway, thereby increasing the distance travelled by the aircraft before the end of the runway. It is unknown whether this procedure increases the likelihood of an aircraft stopping on the runway.

3.0 Conclusions

3.1 Findings

1. The flight crew was certified, trained, and qualified for the flight in accordance with existing regulations.

2. The aircraft was certified and maintained in accordance with existing regulations and approved procedures.

3. There was no evidence found of any airframe failure or system malfunction prior to, or during, the flight.

4. The weight and C of G were within the prescribed limits.

5. The aircraft was not equipped with an ELT as required by ANO Series II, No. 17.

6. The crew carried out a straight-in approach, and did not accurately assess the airport surface winds.

7. The crew were issued the surface wind for Jasper townsite, which they misunderstood to be for the Jasper-Hinton Airport.

8. The crew landed on a downsloping runway with a tail wind of 14 to 21 knots, which exceeded the maximum authorized landing tail wind component.

9. A significant fuel leak occurred due to a punctured left wing fuel tank; however, there was no post-incident fire.

10. A CVR was installed in the aircraft, but had been deactivated by company maintenance.

11. The crew used a higher-than-normal approach speed to compensate for turbulence and subsiding air on final.

12. There is no ERS at this airport, nor was it required.

13. When the crew cancelled their flight plan they did not refile a VFR plan, and were without the benefit of any ATC flight following.

14. The straight-in visual approach to the uncontrolled airport was not as recommended in the *AIP Canada* procedures.

3.2 Causes

The aircraft overran the runway because the crew landed with a 14- to 21-knot tail wind. Contributing to the occurrence were the crew's belief that the calm winds given to them by the Area Control Centre for Jasper townsite were for the Jasper-Hinton Airport, and their decision to continue with the straight-in approach procedure without overflying the airport.

4.0 Safety Action

The Board has no aviation safety recommendations to issue at this time.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson John W. Stants, and members Zita Brunet and Maurice Harquail, authorized the release of this report on 08 February 1996.

Appendix A - Glossary

ACC	Area Control Centre
AIP	Aeronautical Information Publication
ANO	Air Navigation Order
asl	above sea level
ATC	air traffic control
ATF	aerodrome traffic frequency
ATPL	Airline Transport Pilot Licence
AWOS	Automated Weather Observation System
CAP	Canada Air Pilot
C of G	centre of gravity
CVR	cockpit voice recorder
ELT	emergency locator transmitter
ERS	emergency response service
FDR	flight data recorder
FL	flight level
FSS	flight service station
hr	hour(s)
ICAO	International Civil Aviation Organization
IFR	instrument flight rules
lb	pound(s)
MAC	mean aerodynamic chord
MANOPS	Air Traffic Control Manual of Operations
MHz	megahertz
MST	mountain standard time
N	north
nm	nautical miles
PPC	pilot proficiency check
SMELS	Single, multi-engine land and sea rating (Endorsement on Pilot's Licence)
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
VFR	visual flight rules
V_{ref}	reference speed
W	west
°	degree(s)
'	minute(s)
"	second(s)
<	less than

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