AIRCRAFT ACCIDENT REPORT
JETCO AVIATION, INCORPORATED
SHORT BROTHERS & HARLAND, LTD.
SKYVAN SERIES 3 (SC-7), N21CK
WASHINGTON NATIONAL AIRPORT
WASHINGTON, D.C.
JULY 2, 1970
SA - None

File No. 3-0594

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WASHINGTON NATIONAL AIRPORT
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JULY 2, 1970
Adopted: January 13, 1971

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D. C. 20591
REPORT NUMBER: NTSB-AAR-71-6
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ADMITTED: January 13, 1971

Jetco Aviation, Incorporated
Short Brothers & Harland, Ltd.
Skyvan Series 3 (SC-7), N21CK
Washington National Airport,
Washington, D. C.
July 2, 1970

SYNOPSIS

At approximately 10:48 a.m. eastern daylight time on July 2, 1970, Short Brothers & Harland, Ltd., Skyvan Series 3, N21CK, operated by Jetco Aviation, Inc., Washington, D. C., as air taxi cargo flight, Flight 106, crashed during a VOR approach to Washington National Airport. The aircraft was demolished but did not burn. Both crew members received fatal injuries. There were no passengers.

According to witnesses, the aircraft was first visible to them, through fog and haze, when it was 700 to 800 feet above and about one-half mile out from the threshold of Runway 15. Shortly after the aircraft came into view of the witnesses, it nosed down and rolled left until the wings were nearly vertical. The nosedown angle steepened progressively until it reached 45° or more. The aircraft struck the water of Roaches Run in this attitude, cartwheeled onto the right wingtip and sank in water 12 to 15 feet deep about 1,800 feet north of the threshold of Runway 15.

The Board determines that the probable cause of this accident was the loss of effective elevator control due to the forward shift of improperly secured cargo when the aircraft was placed in a steep nosedown attitude during a W-approach in reduced visibility conditions.

As a result of this investigation the Board recommends that:

The Federal Aviation Administration (FAA) take the necessary action to instruct all air taxi cargo operators to stow and secure their cargo in accordance with the provisions of Part 135.117 of the Federal Aviation Regulations and the manufacturer's specifications for the aircraft involved.

As a result of information obtained during this investigation, Short Brothers & Harland, Limited, Belfast, Northern Ireland, issued two Service Bulletins:

Service Bulletin No. 27-53 • Flying Controls:

To introduce a re-designed fork end fitting on the Anti-Up Float Spring Pot in Elevator Control Circuit.
Service Bulletin No. 25-56 - Equipment & Furnishings:

To fit guards at rear of 1st and 2nd Pilot's Seats.

INVESTIGATION

Jetco Aviation, Inc., Skyvan, Flight 106, N21CK, was completing the last leg of a point-to-point cargo flight that originated at Washington, D. C., at approximately 1730 on the previous day. Jetco Flight 106 was scheduled to depart John F. Kennedy International Airport (JFK), New York, at 0600, July 2, 1970; however, because of en route delays, departure from JFK was not until 0856. The flight was made in accordance with a visual flight rules (VFR) flight plan until it arrived in the vicinity of Atlantic City, New Jersey. The crew then filed an abbreviated instrument flight rules (IFR) flight plan and the flight was cleared to the Washington National Airport.

As Flight 106 approached Washington, D. C., the crew received clearance for a VOR 2 approach to Runway 15 and at 1047:25, the tower controller at Washington National Airport (DCA) cleared the flight to land. He advised the crew that the surface wind was from 200° at 5 knots, and asked them if they had the airport in sight. At 1047:35, the crew replied, "Tower, not yet, we've got the Pentagon here." At 1047:55, the crew reported, "106 has the runway." This was the last communication from the aircraft and, 5 to 10 seconds later, the local controller and his assistant saw the aircraft at an estimated altitude of 500 feet. It was in a steep, diving bank to the left when it disappeared from their view.

The crew members were properly certificated and medically qualified for the performance of their duties. The copilot, a part-time pilot, was making his first trip with Jetco. The duty time for both pilots the preceding 24 hours was 18:18 hours. (For details, see Attachment 2)

The aircraft was properly certificated for the flight. N21CK, serial No. SH1858, was a cargo configuration of the Skyvan Series 3, Model SC-7, Variant 200. (For details, see Attachment 3.)

The maintenance records for the aircraft show that it had met the airworthiness standards in all maintenance categories except one; at the time of the accident, the aircraft had accumulated 111:86 hours since the last 100-hour inspection.

The aircraft fuel tanks were filled with jet fuel prior to the departure from John F. Kennedy International Airport.

The cargo floor in this type of aircraft contains 70 cargo-restraint fittings. Each fitting is designed for a load of 4,000 pounds. The cargo hold is 18 feet

1/ All times used herein are eastern daylight, based on the 24-hour clock.
2/ Very high frequency omnidirectional range. The landing minima for a VOR approach to Runway 15 are 700 feet ceiling and 1 mile visibility for propeller-driven aircraft.
7 inches long, 6 feet 6 inches wide, and 6 feet 6 inches high. There are seven seat-retaining rings on each side of the cargo compartment, which are not designed to restrain cargo. The front and rear rings are single and all the rest are double rings. Following the accident, tensile strength tests of these ring assemblies were made by the National Bureau of Standards. The tests revealed that failure occurs along the longitudinal axis of the bracket when a load of 1,330 pounds is applied. Failure occurs $45^\circ$ to the longitudinal axis when a load of 400 pounds is applied.

The driver who delivered the New York cargo consignment to the aircraft later assisted the crew in loading some of the heavier boxes. The New York cargo weighed 2,766 pounds and was contained in 67 cartons and boxes. The driver noticed that some cargo had been previously loaded in the forward section of the cargo compartment. This cargo weighed 611 pounds and was contained in 29 boxes and cartons that were loaded on board at Boston. The driver said that most of the cargo he delivered was loaded on a "plywood" sheet, directly over cargo rollers, in the forward section of the cargo area, and the remainder was wedged along the sides. He saw the crewmembers tie down the cargo. He said they used one web-type nylon strap. One end of this strap was secured at a forward point on the left sidewall of the cabin. The other end was placed around the rear of the cargo and secured at a point on the right rear sidewall of the cabin. A crewmember then used a ratchet to tighten the strap at the right side point.

The 1029 surface weather observations, taken at Washington National Airport prior to the accident, were:

- Estimated ceiling 8,000 feet overcast, visibility 24 miles, fog, haze; wind from $200^\circ$, 5 knots, altimeter setting 29.94.

The 1057 reported Washington National Airport weather observation was as follows:

- Estimated ceiling 8,000 feet overcast, visibility 24 miles, fog, haze; temperature $77^\circ$ F., dew point $73^\circ$ F., wind from $180^\circ$, 5 knots, altimeter setting 29.94.

Runway 15 at Washington National Airport is 5,212 feet long and 200 feet wide. Runway 15 has high-intensity runway lights, runway end identifier lights, and a Visual Approach Slope Indicator (VASI). All field lights were on at full brightness.

- The airport elevation is 15 feet m.s.l. The distance from the end of Runway 15 to the Pentagon is 0.8 nautical miles. (See Attachment 4.)

The flightpath of the aircraft at impact was approximately $50^\circ$ magnetic. The center point of the wreckage area was located about 240 feet from the nearest shore under 12 to 15 feet of water. Approximately 95 percent of the aircraft was

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/ mean sea level.
salvaged from a circular area in the water about 170 feet in diameter. Missing items included the copilot’s seat, some instruments, both flight control columns, and some small pieces of fuselage skin.

All of the recovered trim control cables sustained tension failures. All of the turnbuckles were intact and safety wired. The elevator trim actuator was $1^\circ$ down ($1^\circ$ noseup trim). The total trim available was $5^\circ$ noseup and $4^\circ$ nosedown.

The right wing was recovered practically intact but without the engine and nacelle. The aileron and two sections of flap were attached to the wing. The flap was partially extended. Measurements of the flap actuator in the aircraft were compared with measurements of a similar aircraft with the flaps in various positions. These comparisons indicated that the flaps on Flight 106 were extended $50^\circ$ (full down) at impact. The right flap impact mark on the fuselage measured $50^\circ$. Both wing flaps are operated by one actuator, and the position of one flap corresponds mechanically to the position of the other flap.

The left wing was recovered in two pieces. One piece, the inboard quarter behind the main spar, had a section of flap attached. The other piece comprised the remainder of the wing, less the aileron and the engine. The left engine had separated from the wing at the main mounts.

The right side of the empennage was essentially intact. The left vertical stabilizer, left rudder, and left side of the elevator had separated from the empennage, but were recovered.

The nose section, the pilot’s half of the cockpit, and the entire left side of the fuselage were fragmented. The right side of the fuselage, including the top of the copilot’s entrance door, showed four slashmarks. The pilot’s entrance door, the ditching hatch, and the rear cargo doors were recovered. The cargo floor was examined, and all cargo restraint rings were found to be intact except for two on the left side where the floor was broken. None of the cargo restraint rings had cargo strap hooks attached, nor was there any evidence that any had been attached. Four cargo rollers and a $1\frac{1}{2}$-inch thick pressed-wood pallet were recovered. Two of the rollers were each 10 feet long and two were 5 feet long.

Seven nylon cargo straps were aboard the aircraft at impact. These were recovered and none of the straps was broken. Cargo nets were not used on this flight.

One cargo strap hook had a single fuselage seat-storage ring attached and another strap hook had double fuselage seat-storage rings attached. These two straps were wrapped about each other when salvaged.

Of the five remaining straps, one that was compactly rolled was found lodged under the pilot’s seat. The other four were loose with all locking and ratchet mechanisms and hooks intact.

The engines and propellers were examined under NTSB cognizance at the Airesearch plant at Phoenix, Arizona. This examination showed that both engines were rotating at impact and that both propellers were set for landing approach power.
No evidence was found that would indicate any preimpact malfunction or failure of the aircraft systems that could be related to the cause of the accident. The entire flight control system was recovered, including all the push-pull rods and rod end fittings in the empennage. All breaks were typical of breaks resulting from gross bending and tension overloads. The elevator anti-up float spring pot assembly was still attached to the fuselage attaching structure. However, the clevis end of this assembly was separated in the threaded section with the clevis end attached to its respective bell crank. The fractured ends showed preimpact fatigue cracks on the top and bottomsides through approximately 20 percent of the cross-sectional area. The cracks were typical of fairly low cycle, high-stress type fatigue propagation. This assembly supplies artificial "feel" of elevator control force to the pilot in the last 30 percent of up-elevator travel, and its eventual failure would not affect the controllability of the aircraft.

The accident was nonsurvivable. Autopsies showed that both pilots sustained fatal injuries as the result of impact.

The maximum certificated takeoff and landing weight for the aircraft is 12,499 pounds. The following computations relate to the weight and balance of N21CK on departure from JFK, using actual weights:

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<td>Crew</td>
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<td>Flight bags</td>
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<tr>
<td>Fuel</td>
<td>2,260</td>
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<tr>
<td>Cargo</td>
<td>3,412</td>
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<td>Miscellaneous equipment</td>
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<td>Total weight at takeoff</td>
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<td>Estimated fuel burnoff</td>
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<td>Estimated aircraft gross weight at time of crash</td>
<td>13,190 pounds</td>
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The aircraft was about 1,600 pounds overweight for takeoff; however, the manufacturer states that "experience has shown that this in itself would not be dangerous although performances after an engine failure would be marginal."

The maximum trimmable center of gravity limit forward is 10 percent of the mean aerodynamic chord (MAC) ahead of the forward center of gravity limit. Beyond this point, the aircraft is uncontrollable. The computed center of gravity for the aircraft at takeoff was 2.30% forward of the forward limit. The manufacturer states, "Although wrongly loaded this is still well within the trimmable range."

**ANALYSIS AND SUMMARY**

Investigation of the aircraft, engines, systems, and aircraft records indicated that there were no mechanical malfunctions or failures of the aircraft that could be related to the probable cause of the accident.
Air Traffic Control functions were properly executed as they related to Flight 106, and there was no evidence of any equipment or navigational facility malfunctions.

The reported visibility was 2 \( \frac{1}{2} \) miles with fog and haze; however, there is evidence that the crew did not see Runway 15 until the aircraft had approached to within about one-half mile, or less, from the end of the runway. They did not have the runway in sight in the vicinity of the Pentagon, which is 0.8 nautical mile from the end of the runway.

The landing minima on this approach to Runway 15 is ceiling 700 feet and one mile visibility, requiring that the pilot maintain a minimum m.s.1 altitude of 715 feet until the runway is in sight. This would account for the high approach altitude which ground witnesses observed and estimated to be between 700 and 800 feet.

The cargo floor of the aircraft was adequate for cargo tiedown; however, the cargo was not secured in accordance with approved procedure. There were no cargo nets aboard. None of the cargo straps was anchored to the floor tiedown rings either fore and aft or from side to side over the load. (See Attachment 8.) The cargo tiedown straps used were attached to a forward sidewall seat-retaining ring, placed around the rear of the load, and attached to an aft sidewall seat-retaining ring.

Assuming that the pilot was flying at about 700 feet altitude at one-half a mile out, it would be necessary for him to descend at a rate of at least 2,100 feet per minute (f.p.m.), on a glide slope of about 13° to be in proper landing position over the runway. A normal rate of descent for a standard landing glide slope of 3° is about 400 f.p.m.

A STOL aircraft, such as the Skyvan, is capable of making a steep glide slope final approach to a runway due to its high lift features. However, in order to make a good a 13° glide slope, the deck angle of the aircraft must be changed drastically. Initially, the power is reduced to idle and the pilot then lowers the flaps to full down. This maneuver, which combines a steep nosedown attitude, full flaps, and the drag from the propellers would have caused forward longitudinal forces to be exerted on the 96 boxes and cartons in the cargo hold. If this cargo were not properly restrained from these forward forces, it would progress forward, moving the aircraft center of gravity accordingly. As the center of gravity moved beyond its forward controllable limit, effective elevator control would be lost. (See Attachment 5.) Witness descriptions of the aircraft's nose dropping down through a 45° angle indicate that a progressive control loss of this type occurred.

Probable Cause

The Board determines that the probable cause of this accident was the loss of effective elevator control due to the forward shift of improperly secured cargo when the aircraft was placed in a steep nosedown attitude during a landing approach in reduced visibility conditions.
Recommendations

As a result of this investigation the Board recommends that:

The Federal Aviation Administration (FAA) take the necessary action to instruct all air taxi cargo operators to store and secure their cargo in accordance with the provisions of Part 135.117 of the Federal Aviation Regulations and the manufacturer's specifications for the aircraft involved.

Corrective Actions

As a result of information obtained during this investigation, Short Brothers & Harland, Limited, Belfast, Northern Ireland, issued two Service Bulletins.

Service Bulletin No. 27-53 - Flying Controls:

To introduce a redesigned fork end fitting on the Anti-Up Float Spring Pot in Elevator Control Circuit. (See Attachment 6.)

Service Bulletin No. 25-56 - Equipment & Furnishings:

To fit guards at rear of 1st and 2nd Pilot's Seats. (See Attachment 7.)

By the National Transportation Safety Board:

/s/ JOHN H. REED
Chairman

/s/ OSCAR M. LAUREL
Member

/s/ FRANCIS H. MCADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

January 13, 1971
1. **Investigation**

The Board received notification of the accident at 1102 a.m., on July 2, 1970. The **Investigator-in-Charge** was dispatched immediately to the scene from the Washington Field Office at Dulles International Airport, with technical assistance from Washington, D.C. Working groups were established for operations, witnesses, air traffic control, structures, powerplants, aircraft and maintenance records, systems, and human factors. Parties to the investigation were Jetco Aviation, Inc., the Federal Aviation Administration, Short Brothers & Harland, Ltd., the Garrett Corporation, and Airesearch Manufacturing Company. The on-scene phase of the investigation was completed in about 9 days due to the need for underwater salvage operations. Tests and failure analysis of specific aircraft parts were conducted at the Safety Board headquarters and at the National Bureau of Standards. The engines were examined at the Airesearch Mfg. Co. plant at Phoenix, Arizona.

2. **Hearing**

There was no public hearing.

3. **Preliminary Reports**

An interim report of investigation summarizing the facts disclosed by the first phase of the investigation was published on September 14, 1970.
# PILOT HISTORY

## A. Pilot-in-Command

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<td>Louis John Weins, Jr.</td>
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<td>2215 West Loma Dr.</td>
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<td>Robert Gilmour Williams</td>
<td>4/25/35</td>
<td>USA</td>
<td>RF</td>
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<tr>
<td>8700 Colvyn Road</td>
<td></td>
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<tr>
<td>Oxen Hill, Maryland</td>
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**NOTES:** Form 3336-4 PAGE 6
## 21. Aircraft History

<table>
<thead>
<tr>
<th>Make</th>
<th>Model</th>
<th>Source of Information</th>
<th>Registration Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Bros. &amp; Harland Ltd.</td>
<td>Skyvan SC-7</td>
<td>Aircraft Log</td>
<td>N 210ck</td>
</tr>
</tbody>
</table>

### Issue Date

- **Type**: 6/18/69
- **Normal, Utility, Experimental**: Normal
- **Transport**: 701.0
- **Provisional**: 701.0
- **Restricted**: 111.86
- **Limited**: Annual
- **Experimental**: 6/13/70

### Last Inspection

- **Date**: 6/13/70
- **AIRC. Msite at Time of Inspection**: 506.14

### Engines

<table>
<thead>
<tr>
<th>No.</th>
<th>Make and Model</th>
<th>Serial No.</th>
<th>Type of Maintenance</th>
<th>Total Time</th>
<th>Time Since Overhaul</th>
<th>Time Since Last Inspection</th>
<th>Type of Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Garrett AiResearch TPE 331-2-200A</td>
<td>900147</td>
<td>Annual</td>
<td>701.0</td>
<td>701.0</td>
<td>111.86</td>
<td>Annual</td>
</tr>
<tr>
<td>2</td>
<td>TPE 331-2-200A</td>
<td>900405</td>
<td>Annual</td>
<td>1103.4</td>
<td>1103.4</td>
<td>111.86</td>
<td>Annual</td>
</tr>
</tbody>
</table>

### Propellers/Rotors

<table>
<thead>
<tr>
<th>No.</th>
<th>Make and Model</th>
<th>Serial No.</th>
<th>Time Since New or Overhaul</th>
<th>Type of Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hartzell HC-BETR-50/T 10020 HB</td>
<td>BV 469</td>
<td>701.0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>BV 465</td>
<td>701.0</td>
<td></td>
</tr>
</tbody>
</table>

### Radio Equipment Installed

- **VOR**: No
- **ILS**: No
- **ADF/DF**: No
- **Marker Beacon**: No
- **Other (Identify)**: VHF
- **LF/MF**: No
- **Radar**: No

### Flight Instruments Installed

- **Elect. Vacuum**: None
- **Compass**: No
- **Turn and Bank**: X
- **Altimeter**: 2
- **Airspeed Indicator**: 2
- **Attitude Indicator**: 2
- **Directional Gyro**: 2
- **Rate of Climb**: 2
- **Clock**: 2
- **Integrated Flight System**: N/A
- **AutoPilot**: N/A
- **Approach Coupler**: N/A
- **Altitude Control**: N/A
- **Flight Recorder**: N/A
- **Stall Warning Indicator**: N/A
- **Safe Flight Indicator**: N/A
- **Other (Identify)**: No

### Miscellaneous Equipment Installed

- **Miscellaneous**: Fuel Tank Vent Heater, N/A
- **Magnetic Compass**: X
- **Flares**: No
- **Navigation Lights**: 2 aboard & found
- **Landing Lights**: 2 aboard & found
- **Anti-Collision Lights**: 2 aboard & found
- **Instrument Lights**: 2 aboard & found
- **Pilot Heater**: No
- **Pitot Heater**: No
- **Fuel Tank Vent Heater**: No
- **Flashlight**: No

### 22. Collision Accidents

For mid-air collisions, a separate NTSB Form 6120.4 is required for each aircraft involved, and a NTSB Form 6120.4A.

### Other Aircraft Involved

#### Other Aircraft Mark

- **Make and Model**: No
- **Name and Address of Owner**: No

### 23. Narrative Statement of Facts, Conditions, and Circumstances Surrounding Accident

(Give a concise, chronological sequence of events and detail the environmental conditions at the time of occurrence)
SKYVAN - N21CK

ACCIDENT AT WASHINGTON, D. C.

Note on Weight and Balance

Short Brothers & Harland Ltd., Belfast, Ireland, manufacturers of SKYVAN N21CK, prepared an analysis of the weight and balance conditions involved in the crash of Flight 106. The report of this analysis contains the following computed conditions:

Estimate of effect of cargo shift

Assume main cargo package becomes dismantled due to acceleration caused by deceleration of aircraft and moves as predicted.

<table>
<thead>
<tr>
<th>Aircraft on approach</th>
<th>13221</th>
<th>t</th>
<th>0.746</th>
<th>t</th>
<th>9865</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take out main payload</td>
<td>2766</td>
<td>t</td>
<td>1.170</td>
<td>t</td>
<td>3236</td>
</tr>
<tr>
<td>Take out fwd. payload</td>
<td>611</td>
<td>t</td>
<td>5.17</td>
<td>t</td>
<td>3159</td>
</tr>
<tr>
<td></td>
<td>9844</td>
<td>t</td>
<td>9788</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Add displaced main payload 2766 - 2.25 = 6224
Add displaced fwd. payload 611 - 5.58 = 3409

Aircraft in final condition 13221 t 0.012 t 155 (0.21%)

After assumed cargo shift

The aircraft was now down to 13221 lb. and the amount of overweight was 721 lb. which would scarcely have been noticeable.

With a CG arm of 0.012 ft., the CG was 0.833 - 0.012 = 0.821 ft. (9.85 ins.) forward of the normal forward limit = 0.821 x 100

= 14.3% SMC forward of forward limit. This is outside the trimmable forward limit which is 10% SMC forward of the normal.
Flying Controls: To introduce a re-designed fork end fitting on the Anti-Up Float Spring Pot in Elevator Control Circuit.

Modification No. 1080

1. Planning Information
   A Effectivity Skyvan Series 3
   B Reason Evidence of a premature fatigue has been reported.
   C Description The fork end fitting on the spring pot has been re-designed in steel.
   D Compliance Recommended.
   E Approval This modification and the technical contents of this Bulletin which affect airworthiness have been approved under the authority of the Air Registration Board Design Approval No. AD/1023/45.
   F Manpower 4 Man Hours.
   G Material Cost and availability Modification Kit No. 27-53 is required to accomplish this modification. The price of the kit is €19.00 and may be obtained from:

   Skyvan Co-Ordinator
   Product Support Department
   Short Brothers & Harland Ltd
   Queen's Island
   BELFAST BT3 9DZ

   This offer is available for three months after receipt of this Bulletin.
Flying Controls: To introduce a re-designed fork end fitting on the Anti-up Float Spring Pot in Elevator Control Circuit.

Modification No. 1080

1. Planning Information (Cont'd.)

H Tooling

No special tooling is required for this modification.

I Weight & Balance

Weight change to 0.1 lb.
Moment change to 2 lb/ft

J References

See Service Parts Catalogue Chap. 27-10 Fig.12
SHORTS
SERVICE BULLETIN
NUMBER 25-56

Equipment & Furnishing: To fit guards at rear of 1st and 2nd Pilot's Seats.

Modification No. 1086

1. Planning Information

A Effectivity
   Skyvan Series 3

B Reason
   To ensure that mechanical controls in pilot's seat pedestal are fully guarded.

C Description
   Fit guard under seat frame SC7-16-160 at rear of seat and cover 2 flanged holes in seat back.

D Compliance
   Recommended.

E Approval
   This mod has been approved by the Air Registration Board and the technical contents of this Bulletin affecting airworthiness has been approved under the authority of the Air Registration Board Design Approval No. AD/1023/45.

F Manpower
   5 Man Hours.

G Material Cost and Availability
   Mod Kit 25-56 is required to accomplish this mod. The price of the kit is £21.34 and is available for three months after receipt of this Bulletin. Orders for kits should be addressed to:

   Skyvan Co-Ordinator
   Product Support Department
   Short Brothers & Harland Ltd
   P.O. Box 241
   Queen's Island
   BELFAST BT3 9DZ

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SHORT BROTHERS & HARLAND LTD. - P.O. BOX 241 QUEEN'S ISLAND BELFAST 3 N. IRELAND
Telegrams: AIRCRAFT BELFAST Telephone: BELFAST 58444 Telex: 74688
Equipment & Furnishing: To fit guards at rear of 1st and 2nd Pilot's Seats,

Modification No. 1086

1. Planning Information (Cont'd.)
   
   H Tooling
   No special tooling required.

   I Weight & Balance
   Weight change 5.5 lb.
   Moment change 4 lb.ft.

   J Reference
   Illustrated Parts Catalogue
   Chapter 25.10 Fig 2 and 3.