

NATIONAL TRANSPORTATION SAFETY BOARD PILOT/OPERATOR AIRCRAFT ACCIDENT/INCIDENT REPORT

This form to be used for reporting civil and public aircraft accidents and incidents

Accident/Incident Location Nearest City/Place: <u>Kamuela</u> State: <u>HI</u> ZIP: <u>96743</u> Country: <u>USA</u> Latitude: <u>N20 06.731</u> Longitude: <u>W155 41.158</u> <i>(Enter in decimal degrees or degrees: minutes: seconds)</i>		Accident/Incident Date/Time Date: <u>10/04/2016</u> Local Time: <u>9:10 AM</u> <i>mm/dd/yyyy</i> Time Zone: <u>Hawaii</u> Collision with Other Aircraft: ☐ Midair ☐ On-ground ☒ None																																															
Registration Number: <u>N311VT</u> Manufacturer: <u>MD Helicopters</u> Model: <u>369E</u> Serial Number: <u>0229E</u> Year of Manufacture: <u>1987</u> Amateur-Built: ☐ Yes ☒ No If Yes: ☐ Kit Plans ☐ Original Design Make: _____		☐ IFR-Equipped and Certified ☐ Commercial Space Flight ☐ Unmanned Aircraft Maximum Gross Weight: <u>3000</u> lbs Weight at Time of Accident/Incident: <u>2412</u> lbs Number of Seats: <u>5</u> Flight Crew Seats: <u>1</u> Cabin Crew Seats: <u>0</u> Passenger Seats: <u>4</u> Number of Engines: <u>1</u>																																															
Category of Aircraft ☐ Airplane ☐ Balloon ☐ Blimp/Dirigible ☐ Glider ☐ Gyroplane ☒ Helicopter ☐ Powered Lift ☐ Rocket ☐ Ultralight ☐ Unknown	Type of Airworthiness Certificate <i>(Check all that apply)</i> Standard ☒ Normal ☐ Aerobatic ☐ Balloon ☐ Commuter ☐ Transport ☐ Utility ☐ Certificate of Authorization or Waiver (COA) ☐ None	Landing Gear <i>(Check all that apply)</i> ☐ Retractable ☐ Tricycle ☐ Amphibian ☐ Emergency Float ☐ Float ☐ Hull ☐ Other Launch/Recovery System ☐ None ☐ Unknown	Engine Type (Select one) ☐ Reciprocating ☒ Turbo Shaft ☐ Turbo Prop ☐ Turbo Jet ☐ Turbo Fan ☐ Electric ☐ Liquid Rocket ☐ Solid Rocket ☐ Hybrid Rocket ☐ None ☐ Unknown Fuel System Type (Reciprocating) ☐ Carburetor ☐ Fuel-Injected																																														
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Engine</th> <th>Engine Manufacturer</th> <th>Engine Model/Series</th> <th>Manufacturer's Serial Number</th> <th>Date of Mfg. mm/dd/yyyy</th> <th>Rated Power ☒ Horsepower or ☐ lbs of Thrust</th> <th>Total Time (hours)</th> <th>Time Since: Inspection (hours)</th> <th>Overhaul (hours)</th> </tr> </thead> <tbody> <tr> <td>Eng. 1</td> <td>Rolls Royce</td> <td>250 C20R/2</td> <td>833655</td> <td>11/20/1980</td> <td>450</td> <td>10177</td> <td>1244</td> <td>2964</td> </tr> <tr> <td>Eng. 2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Eng. 3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Eng. 4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Engine	Engine Manufacturer	Engine Model/Series	Manufacturer's Serial Number	Date of Mfg. mm/dd/yyyy	Rated Power ☒ Horsepower or ☐ lbs of Thrust	Total Time (hours)	Time Since: Inspection (hours)	Overhaul (hours)	Eng. 1	Rolls Royce	250 C20R/2	833655	11/20/1980	450	10177	1244	2964	Eng. 2									Eng. 3									Eng. 4									Last Inspection Type ☒ 100-Hour ☐ Continuous Airworthiness ☐ AATP ☐ Conditional Inspection ☐ Annual ☐ Unknown Date Last Inspection: <u>09/16/2016</u> <i>mm/dd/yyyy</i> Airframe Total Time: <u>17334</u> hrs hours measured at (Select one) ☒ Last Inspection ☐ Time of Accident/Incident			
Engine	Engine Manufacturer	Engine Model/Series	Manufacturer's Serial Number	Date of Mfg. mm/dd/yyyy	Rated Power ☒ Horsepower or ☐ lbs of Thrust	Total Time (hours)	Time Since: Inspection (hours)	Overhaul (hours)																																									
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Type of Maintenance Program (Select one) ☐ Annual ☐ Conditional (Amateur-built only) ☒ Manufacturer's Inspection Program ☐ Other Approved Inspection Program (AAIP) ☐ Continuous Airworthiness ☐ Other, specify: _____		Description of Fire Extinguishing System ☐ None ☒ Specify: <u>2 1/2 lb. Halon</u>																																															
Propeller 1 ☐ Fixed Pitch ☐ Controllable Pitch ☐ Ground Adjustable Manufacturer: _____ Model: _____		Propeller 2 ☐ Fixed Pitch ☐ Controllable Pitch ☐ Ground Adjustable Manufacturer: _____ Model: _____																																															
ELT Installed: ☒ Yes ☐ No If Yes: ELT Manufacturer: <u>Artex</u> Model or Part No.: <u>ME406HM</u> TSO No.: <u>OC91 (121.5 MHz)</u> <u>OC91a (121.5 MHz)</u> <u>OC126 (406 MHz)</u> Was ELT still mounted in aircraft? ☒ Yes ☐ No Was ELT still connected to antenna? ☒ Yes ☐ No Did ELT Activate? ☐ Yes ☒ No If activated: Did ELT Aid in Locating Aircraft: ☐ Yes ☒ No If not activated: Indicate Reason: ☐ Impact Damage ☐ Fire Damage ☐ Battery Expired/Damaged ☐ Unknown		Additional Equipment (Check all that apply) ☐ ADS-B ☐ Airframe Parachute ☐ Angle of Attack Indicator ☐ Autopilot ☐ Data Recorder ☐ Electronic Flight Bag or Handheld Device ☐ Electronic Multifunction Display ☐ Electronic Primary Flight Display ☐ Handheld GPS ☐ Heads Up Display ☐ Onboard Weather ☒ Satellite Tracking Device ☐ Stall Warning System ☐ Video Recording Device ☐ Other, Specify: _____																																															

Appendix 1-11 pages.
Addendum,
NTSB Fm 6120.1
10/19/2016

"Flight Crewmember 1" Responsibilities at the Time of Accident/Incident ☒ Pilot ☐ Co-Pilot ☐ Student Pilot ☐ Flight Instructor ☐ Check Pilot ☐ Flight Engineer ☐ Other Flight Crew																																																																																																				
"Flight Crewmember 1" was pilot flying ☒ Yes ☐ No																																																																																																				
"Flight Crewmember 1" Identification First Name: <u>David</u> City of Residence: <u>Hilo</u> Middle Initial: _____ State: <u>HI</u> ZIP: <u>96720</u> Last Name: <u>Okita</u> Country: <u>USA</u> Age at time of Accident/Incident: <u>54</u> Date of Birth: <u>1962</u> mm/dd/yyyy Certificate Number: _____																																																																																																				
Degree of Injury ☒ None ☐ Fatal ☐ Minor ☐ Unknown ☐ Serious			Seat Occupied ☐ Left ☒ Front ☐ Unknown ☐ Right ☐ Rear ☐ Center ☐ Single			Restraint Type <table border="0" style="width:100%;"> <tr> <th style="text-align: left;">Available</th> <th style="text-align: left;">Used</th> </tr> <tr> <td>☐ None</td> <td>☐ None</td> </tr> <tr> <td>☐ Lap only</td> <td>☐ Lap only</td> </tr> <tr> <td>☐ 3-point</td> <td>☐ 3-point</td> </tr> <tr> <td>☒ 4-point</td> <td>☒ 4-point</td> </tr> <tr> <td>☐ 5-point</td> <td>☐ 5-point</td> </tr> <tr> <td>☐ Unknown</td> <td>☐ Unknown</td> </tr> </table>			Available	Used	☐ None	☐ None	☐ Lap only	☐ Lap only	☐ 3-point	☐ 3-point	☒ 4-point	☒ 4-point	☐ 5-point	☐ 5-point	☐ Unknown	☐ Unknown	Inflatable Restraints ☒ Not Installed ☐ Installed ☐ Not Deployed ☐ Deployed ☐ Unknown																																																																													
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Principal Occupation ☒ Pilot ☐ Other ☐ Unknown		Medical Certificate ☐ None ☐ Class 3 ☐ Class 1 ☐ Driver's License (Sport Pilot only) ☒ Class 2 ☐ Unknown			Medical Certificate Validity ☐ Without limitations/waivers ☐ Unknown ☒ With limitations/waivers ☐ N/A ☐ Special Issuance			Date of Last Medical <u>07/09/2016</u> mm/dd/yyyy																																																																																												
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"Flight Crewmember 2" Responsibilities at the Time of Accident/Incident ☐ Pilot ☐ Co-Pilot ☐ Student Pilot ☐ Flight Instructor ☐ Check Pilot ☐ Flight Engineer ☐ Other Flight Crew																																																																																																			
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Pilot Certificate(s) (Check all that apply) ☐ None ☐ Flight Instructor ☐ Commercial ☐ US Military ☐ Private ☐ Recreational ☐ Airline Transport ☐ Foreign ☐ Student ☐ Sport ☐ Flight Engineer					Medical Certificate ☐ None ☐ Class 3 ☐ Class 1 ☐ Driver's License (Sport Pilot only) ☐ Class 2 ☐ Unknown					Medical Certificate Validity ☐ Without limitations/waivers ☐ Unknown ☐ With limitations/waivers ☐ N/A ☐ Special Issuance		Date of Last Medical _____ mm/dd/yyyy																																																																																							
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Crew Name and Address		Seat Occupied	Injury
First Name: _____	City of Residence: _____	☐ Left ☐ Front	☐ None
Middle Initial: _____	State: _____ ZIP: _____	☐ Center ☐ Rear	☐ Minor
Last Name: _____	Country: _____	☐ Right ☐ Single	☐ Serious
		☐ Unknown	☐ Fatal
			☐ Unknown
Pilot Certificate(s) (Check all that apply)		Restraint Type:	Inflatable Restraints
☐ None	☐ Flight Instructor	Available	Used
☐ Private	☐ Recreational	☐ None	☐ None
☐ Student	☐ Sport	☐ Lap Only	☐ Lap Only
	☐ Commercial	☐ 3-point	☐ 3-point
	☐ Airline Transport	☐ 4-point	☐ 4-point
	☐ Flight Engineer	☐ 5-point	☐ 5-point
	☐ US Military	☐ Unknown	☐ Unknown
	☐ Foreign		
Type Rating/Endorsement for Accident/Incident Aircraft? ☐ Yes ☐ No		Total Flight Time at the Time of this Accident/Incident: _____ hrs	

Crew Name and Address		Seat Occupied	Injury
First Name: _____	City of Residence: _____	☐ Left ☐ Front	☐ None
Middle Initial: _____	State: _____ ZIP: _____	☐ Center ☐ Rear	☐ Minor
Last Name: _____	Country: _____	☐ Right ☐ Single	☐ Serious
		☐ Unknown	☐ Fatal
			☐ Unknown
Pilot Certificate(s) (Check all that apply)		Restraint Type:	Inflatable Restraints
☐ None	☐ Flight Instructor	Available	Used
☐ Private	☐ Recreational	☐ None	☐ None
☐ Student	☐ Sport	☐ Lap Only	☐ Lap Only
	☐ Commercial	☐ 3-point	☐ 3-point
	☐ Airline Transport	☐ 4-point	☐ 4-point
	☐ Flight Engineer	☐ 5-point	☐ 5-point
	☐ US Military	☐ Unknown	☐ Unknown
	☐ Foreign		
Type Rating/Endorsement for Accident/Incident Aircraft? ☐ Yes ☐ No		Total Flight Time at the Time of this Accident/Incident: _____ hrs	

Name and Address		Seat	Injury	Restraint Type		Inflatable Restraints	Age
First Name: <u>Haja</u>	City: <u>Kamuela</u>	☒ Left	☒ None	Available	Used	☒ Not Installed	☐ Under 5 years
Middle Initial: _____	State: <u>HI</u> ZIP: <u>96743</u>	☐ Center	☐ Minor	☐ None	☐ None	☐ Installed	
Last Name: <u>Auwelo</u>	Country: <u>USA</u>	☐ Right	☐ Serious	☐ Lap Only	☐ Lap Only	☐ Not Deployed	<i>If Under 5,</i>
☐ Crew	☒ Passenger	☐ Unknown	☐ Fatal	☒ 3-point	☒ 3-point	☐ Deployed	☐ Child Restraint
		Row: _____	☐ Unknown	☐ 4-point	☐ 4-point	☐ Unknown	☐ Lap-Held
				☐ 5-point	☐ 5-point		☐ Unknown
				☐ Unknown	☐ Unknown		
First Name: <u>Kukui</u>	City: <u>Kamuela</u>	☐ Left	☒ None	Available	Used	☒ Not Installed	☐ Under 5 years
Middle Initial: _____	State: <u>HI</u> ZIP: <u>96743</u>	☐ Center	☐ Minor	☐ None	☐ None	☐ Installed	
Last Name: <u>Kelihoomalau</u>	Country: <u>USA</u>	☒ Right	☐ Serious	☐ Lap Only	☐ Lap Only	☐ Not Deployed	<i>If Under 5,</i>
☐ Crew	☒ Passenger	☐ Unknown	☐ Fatal	☒ 3-point	☒ 3-point	☐ Deployed	☐ Child Restraint
		Row: _____	☐ Unknown	☐ 4-point	☐ 4-point	☐ Unknown	☐ Lap-Held
				☐ 5-point	☐ 5-point		☐ Unknown
				☐ Unknown	☐ Unknown		
First Name: _____	City: _____	☐ Left	☐ None	Available	Used	☐ Not Installed	☐ Under 5 years
Middle Initial: _____	State: _____ ZIP: _____	☐ Center	☐ Minor	☐ None	☐ None	☐ Installed	
Last Name: _____	Country: _____	☐ Right	☐ Serious	☐ Lap Only	☐ Lap Only	☐ Not Deployed	<i>If Under 5,</i>
☐ Crew	☐ Passenger	☐ Unknown	☐ Fatal	☐ 3-point	☐ 3-point	☐ Deployed	☐ Child Restraint
		Row: _____	☐ Unknown	☐ 4-point	☐ 4-point	☐ Unknown	☐ Lap-Held
				☐ 5-point	☐ 5-point		☐ Unknown
				☐ Unknown	☐ Unknown		
First Name: _____	City: _____	☐ Left	☐ None	Available	Used	☐ Not Installed	☐ Under 5 years
Middle Initial: _____	State: _____ ZIP: _____	☐ Center	☐ Minor	☐ None	☐ None	☐ Installed	
Last Name: _____	Country: _____	☐ Right	☐ Serious	☐ Lap Only	☐ Lap Only	☐ Not Deployed	<i>If Under 5,</i>
☐ Crew	☐ Passenger	☐ Unknown	☐ Fatal	☐ 3-point	☐ 3-point	☐ Deployed	☐ Child Restraint
		Row: _____	☐ Unknown	☐ 4-point	☐ 4-point	☐ Unknown	☐ Lap-Held
				☐ 5-point	☐ 5-point		☐ Unknown
				☐ Unknown	☐ Unknown		

Last Departure Point Airport ID: <u>ITO</u> City: <u>Hilo</u> State: <u>HI</u> Country: <u>USA</u>		Time of Departure Time: <u>0745</u> Time Zone: <u>Hawaii</u>		Destination Airport ID: <u>N/A</u> City: _____ State: _____ Country: _____		Type Flight Plan Filed ☐ None ☐ VFR/IFR ☒ Company VFR ☐ IFR ☐ Military VFR ☐ Unknown ☐ VFR Activated? ☐ Yes ☐ No ☐ Unknown	
Type of ATC Clearance/Service (Check all that apply) ☒ None ☐ Special VFR ☐ Special IFR ☐ VFR Flight Following ☐ Cruise ☐ VFR ☐ IFR ☐ VFR On Top ☐ Traffic Advisory ☐ Unknown / NA							
Airspace where the accident/incident occurred (Check all that apply) ☐ Class A ☒ Class G ☐ Military Operations Area (MOA) ☐ Special ☐ Class B ☐ Demo Area ☐ Airport Advisory Area ☐ Air Traffic Control Area ☐ Class C ☐ Warning Area ☐ Jet Training Area ☐ Unknown ☐ Class D ☐ Prohibited Area ☐ TRSA ☐ PAR 93 ☐ Class E ☐ Restricted Area						Altitude of In-Flight Occurrence: <u>3500</u> ft msl	
Source of Pilot Weather Information (Check all that apply) ☐ National Weather Service ☐ Company ☐ Flight Service Station ☐ Military ☐ TV/Radio ☒ Internet ☐ Automated Report ☐ None ☐ Commercial Weather Service (DUATS) ☐ Unknown ☐ On-Board Weather				Weather Observation Facility Facility ID: <u>N/A</u> Observation Time: _____ Time Zone: _____ Distance from Accident Site: _____ nm Direction from Accident Site: _____ degrees true			
Basic Conditions ☒ VMC ☐ IMC ☐ Unknown		Light Condition ☐ Dawn ☐ Dusk ☐ Dark Night ☐ Unknown ☒ Day ☐ Night ☐ Bright Night					
Sky/Lowest Cloud Condition ☐ Clear ☒ Thin Broken ☐ Few ☒ Thin Overcast ☐ Partial Obscuration ☐ Unknown ☐ Scattered		Ceiling ☐ None (Clear) ☐ Obscured ☒ Broken ☐ Indefinite ☐ Overcast ☐ Unknown		Temperature: _____ (C) or _____ (F) Dew Point: _____ (C) or _____ (F) Altimeter Setting: _____ in. Hg or _____ MB			
Lowest Cloud Condition Height <u>500</u> ft agl		Ceiling Height <u>500</u> ft agl					
Wind Direction ☐ Variable -or- Direction: <u>060</u> degrees true		Wind Speed ☐ Calm ☐ Light and Variable -or- Speed: <u>15</u> kts		Wind Gusts ☒ Not Gusting -or- Speed: _____ kts		Visibility <u>0.5</u> miles RVR: _____ feet RVV: _____ miles Density Altitude: <u>unk.</u> ft	
Intensity of Precipitation ☒ Light ☐ Moderate ☐ Heavy ☐ N/A ☐ Unknown		Type of Precipitation (Check all that apply) ☐ None ☒ Drizzle ☐ Freezing Rain ☐ Rain ☐ Ice Pellets ☐ Snow Shower ☐ Snow ☐ Snow Pellets ☐ Ice Pellets Shower ☐ Hail ☐ Snow Grains ☐ Freezing Drizzle ☐ Rain Showers ☐ Ice Crystals				Restriction to Visibility (Check all that apply) ☒ None ☐ Fog ☐ Blowing Dust ☐ Ground Fog ☐ Blowing Sand ☐ Haze ☐ Blowing Snow ☐ Ice Fog ☐ Blowing Spray ☐ Smoke ☐ Dust ☐ Unknown	
Icing Forecast Amount Type ☒ None ☐ N/A ☐ Trace ☐ Rime ☐ Light ☐ Clear ☐ Moderate ☐ Mixed ☐ Severe ☐ Unknown ☐ Unknown		Icing Actual Amount Type ☒ None ☐ N/A ☐ Trace ☐ Rime ☐ Light ☐ Clear ☐ Moderate ☐ Mixed ☐ Severe ☐ Unknown ☐ Unknown		Turbulence Type (Check all that apply) Severity ☐ None ☒ Light ☐ Clear Air ☐ Moderate ☒ Terrain-Induced ☐ Severe ☐ Convective Turbulence ☐ Extreme			
NOTAMs (D and FDC), AIRMETs, SIGMETs, PIREPs in effect at the time of the accident/incident: No data							

Aircraft Damage ☐ None ☐ Substantial ☐ Minor ☐ Destroyed ☒ Unknown		Aircraft Fire ☒ None ☐ Both Ground and In-Flight ☐ In-Flight ☐ Fire at Unknown Time ☐ On-Ground ☐ Unknown		Aircraft Explosion ☒ None ☐ Both Ground and In-Flight ☐ In-Flight ☐ Explosion at Unknown Time ☐ On-Ground ☐ Unknown	
---	--	--	--	--	--

Description of Damage to Aircraft and Other Property *(Use additional sheet if necessary)*

Following extraction of aircraft from landing site, owner/operator has not had access to aircraft to conduct an examination or inspection to determine damage to aircraft.

Describe what occurred in chronological order, including circumstances leading to and nature of accident/incident. Describe terrain and include wreckage distribution sketch if pertinent. Attach extra sheets if needed. State departure time and location, services obtained, and intended destination. Provide as much detail as possible.

See attached Narrative History of Flight.

Operator/Owner Safety Recommendation

Following extraction of aircraft from landing site, operator/owner has not had access to conduct an examination or investigation of the aircraft. At present the operator/owner is unable to provide any recommendations.

Was there Mechanical Malfunction/Failure? ☐ Yes ☐ No
(If yes, list the name of the part, manufacturer, part no., serial no., and describe the failure.)

Unknown. Aircraft operator/owner unable to comment at this time with available evidence.

**Total Time/Cycles
On Part**

_____ Hours
_____ Cycles

**Time Since This Part
Inspected/Overhauled**

_____ Hours

Fuel on Board at Last Takeoff
(Convert from pounds, as necessary)

64 Gallons

Fuel Type

☐ 80/87
☐ 100 Low Lead
☐ 100/130

☐ 115/145
☒ Jet A
☐ Jet A-1

☐ Jet B
☐ JP8
☐ Automotive

☐ Other, specify _____

Other Services, if Any, Prior to Departure

None

Was an emergency evacuation of the aircraft performed? ☐ Yes ☒ No

Method of Exit - Describe how the occupants exited and how many occupants evacuated each location

No emergency evacuation was required. Occupants exited aircraft utilizing normal operating procedures.

Aircraft Registration Number

Manufacturer: _____
Model: _____

Damage to Other Aircraft

☐ Destroyed ☐ Minor
☐ Substantial ☐ None

Registered Owner of Other Aircraft

Name: _____
City: _____
State: _____ ZIP: _____
Country: _____

Pilot of Other Aircraft

Name: _____
City: _____
State: _____ ZIP: _____
Country: _____

Use this space if additional space is needed for any answers.

Date of this Report <u>10/19/2016</u> mm/dd/yyyy	Name of Pilot/Operator: <u>David Okita/ Manulwa Airways, Inc.</u>		
	Signature: <u>[Redacted]</u>		
	- or - ☐ Check here to electronically sign this document		
If a Person Other than Pilot/Operator is Filing Report			
Name: _____		Title: _____	
Signature: _____			
- or - ☐ Check here to electronically sign this document			
NTSB Accident/Incident No. <u>WPR17LA005</u>	Reviewed by NTSB Regional Office <u>OAS WPR</u>	Name of Investigator <u>SMITH, M.</u>	Date Report Received <u>10/31/17</u>

ATTACHMENT TO NTSB FORM 6120.1**Pilot/Operator Aircraft Accident/Incident Report****Narrative History of Flight**

Page 9

Purpose of Flight

The purpose of the flight was to ferry the helicopter to and from a fence construction project site on the Kohala Mountain at the northern tip of the Island of Hawaii, Hawaii. At the project site that is a large acreage of marsh land, the helicopter provided multiple external cargo lift deliveries of fence material to various locations within the project boundary.

External cargo lift means the air movement of cargo by tethering the load to a helicopter with a short length of cable that is connected to the helicopter appurtenance called the cargo hook. The helicopter operated in this configuration at the construction site. The unusual terrain and its vegetation, necessitated this method of cargo movement in lieu of delivery by conventional vehicles or by man on foot.

External Cargo Lift Operation Completed

On October 04, 2016, the helicopter was ferried from Hilo International Airport (HIA) with pilot, no passengers and no cargo to provide external cargo lift support. Enroute to the Kohala Mountain project site, a brief landing was made at the Hawaii Board of Water Supply's Kamuela Reservoir to board two ground workers who manned the ground procedures of the external cargo lift, ie, connect/disconnect/handling of the cargo. On the same day, the helicopter successfully completed the external cargo lift assignment.

Ferry Flight

After completion of the external cargo lift assignment, the helicopter returned to a cargo platform at the construction site to jettison the lift cable and to board the two ground workers and their accompanying baggage for the ferry flight back to the respective bases. The cable was jettisoned by the pilot with the electrical "Release" switch on the flight control stick, the cyclic. After the ground workers loaded and boarded the helicopter, they reported to the pilot with the aircraft's intercom system the completion of the loading, boarding and secure seating. On receipt of this notice, the helicopter pilot initiated lift-off and proceeded into departure flight procedures.

Due to the nature of the terrain and the vegetation, a wood platform measuring approximately 20ft by 20ft was built about 2 ft above grade for the cargo or passengers.

At the platform, the pilot included operational procedures that accounted for the following assessment of the platform and its use as the departure point for the ferry flight.

1. Approach and departure routes to from the platform were clear of obstructions. The situation allowed standard helicopter approach and departure procedures.
2. The platform was constructed because, depending on the rainfall, the marsh character of the terrain may not support the full weight of the helicopter on skids. In any case, without the platform, the helicopter skids and the cargo will be exposed to the risks of deep mud, fluid soil or over-growth of tangling vine-like vegetation.
3. The weight bearing capability of the platform is undeterminable.
4. No full touchdown landings, where the full aircraft weight are released into the skids, were allowed.
5. All contact with the platform for cargo or passengers, were "touch and go" involving the technique of soft touchdown. In a soft touchdown, the helicopter is lowered to the platform until there is square touch between the skid and platform. The pilot maintained continued authority over the helicopter and the helicopter weight. The intention of the touch is to establish sufficient friction between the skid and the surface of the platform to arrest relative movement during loading or unloading of cargo or passengers.

Departure for Ferry Flight

During the final "soft touchdown" for loading and boarding for the return ferry flight, the preflight check of on-board instruments and control devices and sensual monitoring of the helicopter were completed. From the soft touchdown, the helicopter made a routine lift-off and departure from the platform.

Forced Emergency Landing

The lift-off and departure into forward flight (climb and acceleration of speed) proceeded within instrument parameters specified in the operating manuals, without an event or sensual indication of abnormality or difficulties. The helicopter was in stable departure on the enroute course and heading for the cruising altitude and speed.

After about a half a minute into the departure, the helicopter suddenly, without instrument or sensual warning or sign, suddenly vibrated, rocked and shook. The pilot observed the rapid intensification of the condition, concluded that loss of control was imminent and reasoned that immediate landing was necessary for the safety and welfare of the passengers and himself. Within seconds, forced emergency landing procedures were executed to unimproved level terrain covered with dense brush ranging in height, 4 to 10 feet. The helicopter landed upright with skids square to the grade.

Pilot's Recital of Details

The following recital are the pilot's statements of pertinent details, events, procedures or observations that were experienced during the period between the final soft touchdown landing at the platform and his exit from the helicopter at the forced emergency landing site (approximate lapsed time period of 1.25 minutes or 75 seconds).

Pilot's Recital of Pertinent Details

- 1) After the final soft touchdown landing, the loading and boarding of ground workers required less than a minute. Both passengers (ground workers) were visually seen in their respective seat positions and they reported over the helicopter's intercom that they were secured and ready for departure.
- 2) The commencement of departure was announced to passengers over the intercom. A final instrument/device/environment scan was made and the helicopter was lifted to hover, stabilized then transitioned into forward flight.
- 3) The emergency event started with the experience of sudden unusual shake at the cyclic control. The helicopter was approximately one half minute into the departure, estimated at 75 feet above the terrain and flying at 20-25 knots.
- 4) Within seconds, the helicopter control situation rapidly deteriorated. The main rotor track (disk) was visibly distorted with wide separation between blades. Concurrently, there was remarkable vertical shake of the fuselage. The cyclic and collective controls required increased forces. The foot pedals were manageable.
- 5) The speed of deterioration indicated the imminent loss of helicopter control and introduction of risks to the safety and welfare of the passengers and myself. The forced emergency landing procedure was immediately initiated to capitalize every moment of ability to control the helicopter.
- 6) During the forced emergency landing procedure, the helicopter remained controllable and responded to control inputs. A zone of relatively flat terrain with comparatively short vegetation was selected for the landing.
- 7) The helicopter landed upright on the landing skids and engulfed in brush.
- 8) When the collective was lowered to release the helicopter weight into the skids to start the shutdown, the aircraft entered into lateral rocking. The amplitude of the lateral rocking continued to increase, so the standard two minute cool down procedure was omitted and engine shutdown was immediately completed.

- 9) After the engine shutdown and the main rotors had stopped, the passengers were immediately interrogated by the intercom about their condition. Both passengers reported 'no injuries and positive personal safety and welfare'.
- 10) The passengers were notified that arrangements were in progress for emergency extraction by helicopters and the flight back to the respective bases. The passengers were instructed to cut and clear a landing zone for the landing of the responding helicopter(s).
- 11) The request for emergency assistance was made to the Hawaii County Fire Department (HFD). The circumstances of the emergency, head count of personnel, and GPS position data were reported to HFD.
- 12) Extraction of passengers and their baggage from the emergency landing site was completed in about one hour.

ManuIwa Airways, Inc.
Db: Volcano Helicopter
[REDACTED]
Hilo, Hawaii, 96720

National Transportation Safety Board
Western Pacific Region Office (NTSB-WPR), Office of Aviation Safety
Maja Smith, Aviation Accident Investigator
[REDACTED]
Federal way, WA, 98003

Subject: Addendum to NTSB FORM 6120.1, submitted 10/19/2016
Helicopter, FAA #N311VT
Pilot/Operator Aircraft Accident Report

Maja Smith:

Attached hereto are supplemental reports that were published as an Addendum to:

NTSB FORM 6120.1, submitted 10/19/2016
Pilot/Operator Aircraft Accident Report & Narrative History of Flight

General Information.

The insurance policy of helicopter (N311VT) prescribes that items involved in the N311VT's forced emergency landing are the property of the insurer; therefore, they arranged and paid for the extraction of N311VT and related items from the Kohala Mountain site .

Pacific Helicopter, Inc.(Pacific) a Hawaii helicopter operator that specializes in airlift, extracted N311VT and items. In preparation for the extraction, Pacific removed the five (5) main rotor blades from N311VT, and moved them to Hilo as cargo. The remainder of N311VT was flown as external load to Hilo. (The extraction delivered six items, the five main rotor blades and the remainder of N311VT) All items can be seen in Photo #01, attachment. On arrival in Hilo, the items were immediately quarantined by the NTSB and secured in the CAP Hangar at the Hilo International Airport (PHTO)..

The quarantine disallowed the Pilot/Operator (Pilot) to access and inspect the extracted items. Thus, it was necessary to publish and submit the report to the NTSB without the benefit of findings from an inspection. (Pilot/Operator Aircraft Accident Report, NTSB form #6120.1, pages 1 to 11, dated 10/19/2016 and the attachment, "Narrative History of Flight").

Incomplete Report Subdivisions

For the above reason, there were no statements entered into the following subdivisions of the filed Report (NTSB form #6120.1):

Page 9 **DAMAGE TO AIRCRAFT AND OTHER PROPERTY**
Selection: Aircraft Damage, marked Unknown, No Statement filed

Page 10 **RECOMMENDATION**
No Statement filed

Page 10 **MECHANICAL MALFUNCTION/FAILURE**
No Statement filed

Pilot Obligation and Responsibility

The NTSB received and accepted the October 19, 2016 Report. On November 04, 2016, the NTSB closed their field investigation, terminated the quarantine and released the extracted items to the insurance company. These procedures enabled the insurance company to authorize access to the extracted items for inspection.

A professional Pilot is responsible and obligated to thoroughly investigate the emergency landing, including the inspection of the extracted items. On November 5, 2016, the Pilot and support personnel received the insurer's authorization to access and inspect. The inspection was completed on the same day. The findings of facts, analyses, discussions and pertinent conclusions of the post extraction inspection are prepared in the format of an Addendum to:

NTSB FORM 6120.1, filed 10/19/2016
Pilot/Operator Aircraft Accident Report & Narrative History of Flight

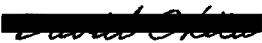
Closing Remarks

The Pilot requests the NTSB and FAA to accept the attached Addendum and include them as a supplement to the original Report.

Thank you for your cooperation and consideration.

Very truly yours,

Manulwa Airways, Inc.



David Y. Okita, VPres & PIC

:ryo.

Attachment: Table of Content

Addendum,	Attachment.01, 2 pg
Damage to Aircraft	Attachment.02, 2pg
External Load Cable	Attachment.03, 2pg
Mechanical Malfunction/Failure	Attachment.04, 6pg
Recommendations	Attachment.05, 1pg
Photos	Photo 01 to 08, 8ea
Pictures	PIC A&B,. 2ea

Cc: Federal Aviation Administration
Flight Standards District Office, Honolulu
Merritte Wilson, Inspector
135 Nakolo Place
Honolulu, HI, 96819

Reference: ADDENDUM
 Pilot/Operator Aircraft Accident Report
 Helicopter - N311VT
 NTSB Form 6120.1

ATTACHMENT.01

Addendum

Additional Information

On the day after the extraction, the Pilot/Operator (Pilot) went to the CAP Hangar to view the quarantined items through the chain-linked gate. The lift cable that was used in the operation prior to the emergency landing, was not seen amongst the extracted items. This observation was immediately reported to the case FAA Inspector.

When the quarantine was terminated, November 05, 2016, the Pilot accessed the CAP Hangar and confirmed the status of the cable: Missing.

Incomplete Report Subdivisions of Pilot/Operator Aircraft Accident Report, 10/19/2016

Three (3) Subdivisions of the submitted Pilot/Operator Aircraft Accident Report were incomplete. These Subdivisions are updated as follows:

Page 9

DAMAGE TO AIRCRAFT AND OTHER PROPERTY

Aircraft Damage:	None	___
	Minor	___
	Substantial	<u>X</u>
	Destroyed	___
	Unknown	___

Aircraft Fire;	None	<u>X</u>
----------------	------	----------

Aircraft Explosion:	None	<u>X</u>
---------------------	------	----------

Description of Damage to Aircraft and Other Property:

There was no damage to Other Property

Go to Attachment.02, "Damage to Aircraft" and Attachment.03, "External Load Cable".

Page 10

RECOMMENDATION

Go to Attachment.05, "Recommendations"

Page 10

MECHANICAL MALFUNCTION/FAILURE

Go to Attachment.04, "Mechanical Malfunction/Failure"

Reference: ADDENDUM
Pilot/Operator Aircraft Accident Report
Helicopter - N311VT
NTSB Form 6120.1

ATTACHMENT.02

Damage To Aircraft

A. No injury to person(s)..

B. No damage to other property.

The insurer's legal counsel/claims adjuster granted authorization to access to the helicopter (N311VT) that included following provision:

The Pilot/Operator (Pilot) shall inspect, measure and record N311VT and the other extracted items in the "as is" situation. Only plates, doors and ports that are intended for routine maintenance may be opened. There shall be no disassembly, removal, lifting or cutting with tools.

The insurer will be selling the extracted N311VT, "Where is, as is".

C. The inspection found that Helicopter, N311VT, was damaged at five (5) locations. Refer to Photo #01, attachment.

1. End plate of horizontal stabilizer. Location #1.
2. Vertical stabilizer, top end of leading edge. Location #2.
3. Main Rotor Blade, one(1), tip separated. Other four (4) of the set of five, were undamaged. Location #3.
4. Tail Rotor Blades, two (2), tip. Location #4
5. There are evidences of damage to the portions of the airframe aft of the engine compartment. The indications are skin wrinkles, popped rivets, skin lifts and deflection of the alignment of the horizontal stabilizer in the horizontal plane. These findings require confirmation by further disassembly with tools to determine compliance to specifications of air worthiness and the requirement for airframe realignment repair. See Photo #01, Note Box, "ARROW POINT TO".

D. Additional Photos are attached hereto to show details of the damages. The photos are identified as follows:

- Photo #02, Entire Left Side.
- Photo #03, Horizontal Stabilizer End Plate
- Photo #04, End Plate, Horizontal & Vertical Stabilizers.
- Photo #05, Vertical Stabilizer, Top
- Photo #06 MR Blade, Vertical View
- Photo #07, MR Blade, End View
- Photo #08, . MR Blade, Back View

E. The inspection determined that two (2) items of N311VT are missing:

1. External load cargo cable, 20ft.
2. Separated tip of one Main Rotor Blade, approximately 9 inches.

F. Search for the Cable and Rotor Blade Tip

The Pilot/Operator conducted a search for the two (2) missing items. The following locations were searched:

1. Wood platform, the location of loading for the return flight.
2. Emergency landing site
3. Flight route between the platform and the Emergency Landing site.

Growth and vegetation allowed only minimal practical ground search. The cover of the ground by vines, dense low shrubbery and marsh restricted visibility and movement. A creditable ground search requires unaffordable clear-cutting of vegetation .

Aerial search (low hover search patterns) was also conducted over the search sites. The visibility through the growth and vegetation was minimal. Only items that hung on top of the vegetation canopy could be seen. See attachment, PIC-A & B, N311VT.

The aerial and ground searches did not locate the Cable and the separated MR Blade tip. The Pilot discontinued the search for the following reasons:

1. Impractical
2. Financial hardship that cannot be justified.

Reference: ADDENDUM
 Pilot/Operator Aircraft Accident Report
 Helicopter - N311VT
 NTSB Form 6120.1

ATTACHMENT.03

External Load Cable

External Load Cable (Cable).

A. A stranded steel cable measuring 3/8 inch diameter, 20 feet long, and weighing 0.30 lbs per foot was used in the external load operation prior to the emergency landing. This cable was attached to the helicopter (N311VT) at the electric cargo hook that is located on the belly of the aircraft. (See attached Photo #01 for electric cargo hook).

B. After the completing the airlift operation, the Pilot used the "Eject" switch, to jettison the Cable from the cargo hook. The ground crew of the external load operation coiled and loaded the cable on the floor of the rear cabin of N311VT for the return ferry flight to base.

C. The Pilot/Operator's (Pilot) check of the extracted items did not locate the Cable. The missing cable was reported by the Pilot to the FAA Case Inspector. The aerial and ground searches did not locate the Cable or the MR Blade tip. The missing Cable raised the concerns:

1. Did the Cable fail to jettison from the cargo hook?
2. Did the ground crew coil and load the Cable in N311VT?
3. The narrative attached to NTSB Report, form #6120,1, 10/19/2016, reported the necessity for the Pilot to remain continuously on the flight controls during the final loading; therefore, the Pilot did not personally conduct an exterior preflight check. The check made by the non-aviation ground crew and the report on the aircraft intercom made in general language.....were they complete and accurate?
4. N311VT was configured without the two rear doors (left & right). Did the Cable slide out?

D. The Pilot investigated the situation of the missing cable and the findings are as follows;

1. The electric cargo hook system was inspected and tested.
 - a. Position of circuit breaker for cargo hook electric supply circuit: "ON"
 - b. The aircraft battery was reconnected to the electrical system. The electric cargo hook release switch was operated and it was followed by the release of the cargo hook jaw. (4 tests)

- c. The pilot lever for mechanical release of the cargo hook jaw was operated and it was followed by the release of the cargo hook jaw. (4 tests)
- d. The lever on the cargo hook base at the belly of N311VT for the mechanical release of the cargo hook jaw was operated and it was followed by the release of the cargo hook jaw. (4 tests).
- e. The attachment of the cargo hook to the aircraft exhibited no abnormal evidence of stress, stretching, loading or operation.
- f. The jaw of the cargo hook exhibited no abnormal evidence of damages from loading or operation.

2. Scenarios where the Cable contacts the main rotor blades were developed, studied and investigated.

- a. Cable attached to electric cargo hook or snagged to landing skids.. The cargo hook is attached to the belly of N311VT between two long landing skids. Any Cable's reach to the main rotor must include contact with the skids and/or the airframe

All surfaces of N311VT were inspected for any evidence of contact with Cable. Evidence in this paragraph means:

- 1). On painted or plastic surfaces: Rub discoloration, scratch or abrasion marks that can evidence contact with the Cable.
- 2) On metal surfaces; Rub discoloration, scratch, abrasion or damage that can evidence contact with the Cable.
- 3) At the five (5) damage location reported by the attachment, "ATTACHMENT.01, "Damage to Aircraft": Rub discolorations, scratch, abrasion or damage that can evidence contact with the Cable.

The post extraction inspection found no evidence of contact between the missing cable, N311VT and its parts.

- B. Cable dropped from the cabin. Coiled Cable dropped from the cabin will fall in the direction away from the main rotor. At the speed of N3112VT, the dropped coiled Cable cannot contact the tail rotor.

Cable contact is further discussed in Attachment.4, "Mechanical Malfunction/Failure".

Reference: ADDENDUM
 Pilot/Operator Aircraft Accident Report
 Helicopter - N311VT
 NTSB Form 6120.1

ATTACHMENT.04

Mechanical Malfunction/Failure

Part One

The Pilot/Operator (Pilot) investigated, inspected and studied the emergency landing of helicopter, N311VT, at a certain site in the Kohala Mountains. The purpose was to determine its cause and to identify those results and experiences that will improve future safety, maintenance and operations.

The Pilot's finding of facts and analyses reasoned the following conclusions:

1. Failure of N311VT's one (1) main rotor blade's leading edge erosion shield a) caused the internal damage of the blade itself and b) adversely unbalanced the kinetic energy, forces and configuration of the main rotor disk. See attached Photo #06, #07 & #08.
2. After the failure, N311VT continued flight with adequate lift and control. However, the progression of the eccentric main rotor disk (unbalanced kinetic energy, forces and blade configuration) was judged by the Pilot-in-Command (PIC) as symptoms of an imminent total loss of lift and control. Immediate emergency landing followed.
3. All other reported damages are collateral to the eccentric main rotor disk.

Part Two

Pilot-in-Command's Report

The emergency landing on unimproved vegetated terrain was the judgment, decision and execution of the Pilot-in-Command (PIC). Briefly, in the written report to the NTSB, the PIC reported:

1. When helicopter (N311VT) departed from the jobsite for the ferry flight back to base, all aircraft parameters and responses were stable and normal. Lift-off, hover, transition into forward flight and entry into the enroute heading were completed without incident.
2. N311VT was 5 to 6 seconds into the air speed acceleration and altitude climb when the initial shake of the cyclic control was identified. The shake frequency and intensity continued to develop.
3. Simultaneously, blade separation was seen in the main rotor disk, and its amplitude was erratic and increasing.

4. Airframe vertical movement (bounce) and vibrations followed.
5. After 3 or 4 seconds of the initial cyclic shake, the flight controls were still manageable but the developments in the main rotor disk and airframe were assessed as leading to the eventual loss of control. The blade separation amplitude had increased to about 9 inches. The shake and vibration of the airframe were significantly more than the effect of heavy turbulence.
6. The judgment call was made - the loss of control was imminent and the situation represented serious risks to the welfare and safety of persons on board.
7. Immediately, an emergency landing into the available terrain was executed. From the initial cyclic shake to the final emergency touchdown/engine shutdown, N311VT was **controllable and responded to all control inputs**.
8. The aircraft landed upright, plumb to the terrain and surrounded by vegetation.

Two photos taken on the day of extraction of N311VT site are attached., "PIC-A N311VT" "PIC-B N311VT" These photos show the nature of the terrain and the final situation of the landing.

Part Three

Findings of Facts

The photos and measurements from the post extraction inspection and the PIC's report are the essential records of the findings. Select photos are parts of this Addendum. Additional photos and notes are in the investigation files of the Pilot/Operator (Pilot).

For reasons previously reported, the investigation and inspection did not include the disassembly of the helicopter (N311VT) nor the laboratory testing of its parts. All analyses by the Pilot were based on the findings of visual inspection, exterior measurements, photographic records and the PIC's report.

The availability of the missing cable and blade tip would have simplified and made lucid the findings of facts. In absence of the missing items, correlating physical evidence and/or events were identified. This approach was used to account for the missing items.

The Pilot acknowledges that the findings of facts was closed with two N311VT items missing, the separated tip of one main rotor blade and the external load cable. The reasons for the closing are stated elsewhere in the Addendum. If conclusive conclusions are mandatory, the search for the missing items must be made by clear cutting the growth and vegetation at the search sites.

Part Four

Discussion - Main Rotor System.

The understanding of the main rotor blade system's physics and engineering is a requisite to the analyses of the N311VT incident.

When not in motion, the N311VT main rotor behaves as five independent relatively narrow air foils connected to a hub.

In operational motion (rotating at flight speed), the five blades synthesize into a single large disk about the hub. This synthesis is the physics of rotating bodies. The behavioral properties of N311VT's main rotor disk are extreme.

1. Angular speed of 485 revolutions per minute (RPM), 8.08 RPSecond
2. Tip travel velocity of 456 miles per hour (MPH), 670 FPSecond.

Within the disk, there are five (5) rotating blades. All five (5) blades will pass through a single point of the disk 8.08 times every second. Likewise, at a point of the disk equal to 12.30 feet from the center, each blade is traveling at 425.7 MPH or 624.36 FPS. Thus, governing conditions of the main rotor disk are:

1. Instantaneous flow or transfer of concentrated kinetic forces and energy (within a period of a fraction of a second).
2. Instantaneous development of events (within a period of a fraction of a second).

To further understand the lethal nature of the main rotor disk, a familiar analogous situation of a 45 caliber bullet fired from a gun is described. The bullet, at the muzzle, is traveling at 511.36 MPH or 750.00 FPS; enroute, it is traveling at 262 MPH or 385 FPS.

Discussion - Categories of Rotor Blade Damage by Cause.

For the purpose of analysis, damage to a rotor blade of a main rotor disk are classified in two categories:

1. Internal - damage due to causes that develop within the rotor disk.
2. External - damage due to a foreign object intrusions into the rotor disk.

Discussion - Characteristics of Blade Damage by Category of Cause

A. Physically, an internal blade damage is distinguished by markings of tensile forces such as stretching, expansion and tearing.

B. Physically, an external blade damage is distinguished by markings of compressive forces such as scratches, abrasions, shears and cuts. Lengthy and flexible objects such as the external load cable, cause damage(s) to other parts of N311VT and tangle into the main rotor system.

C. Generally, internal blade damage is limited to one blade of the rotor disk per event. The blade is damaged by causes within the main rotor disk. Such causes are:

1. Anomaly of the rotor disk hub (blade damper, connectors or control parts)
2. Delamination and tear/lifting of the leading edge erosion shield, or,
3. Erosion and lifting of the leading edge erosion shield.
4. Instantaneous contact with a foreign object in the form of a high speed projectile such as a bullet.
5. Internal structural failure.

One (1) blade internal damage is the subject of many manufacturer's and government reports and publications.

D. Within the rotor disk, an internal damage will develop a) eccentric kinetic energy, b) eccentric blade configuration, and c) transfer of lethal energy to parts of the airframe that are timed (meaning not instantaneous). Compared to external blade damage, internal blade damage develops slowly.

F. An external blade damage caused by the intrusion of a foreign object such as by the external load cable is accompanied by the following conditions:

1. The instantaneous development of eccentric kinetic energy and eccentric blade configuration within the rotor disk.
2. Instantaneous and catastrophic loss of aircraft lift and control.
3. Damages to the other blades of the rotor disk, and depending on the circumstances, the airframe.
4. Instantaneous transfer of lethal energy to all parts of the airframe.

Part Five

Damage to One (1) Blade of Rotor Disk

The following situations are indications of a damage to a single main rotor blade:

1. PIC noted timed (gradual) anomaly development .

2. PIC had N311VT under control throughout the flight to touchdown/engine shutdown.. Despite the nature of the terrain, N311VT made a successful landing.

The post-extraction inspection found one (1) blade damaged and the remaining four (4) blades undamaged. The damage blade's tip end was separated and that portion including its leading edge shield was not found. The separation was 12.30 feet from the hub center

The physical overview of the damaged blade is presented by Photo #06, attachment. The blade is deformed: Bowed leading edge, skin wrinkles and depressions and about nine (9) inches of the tip is separated. The detailed physical view of the damage is presented by Photo #07 and Photo #08.

The findings corroborates an internal blade damage. The damage at the tip separation is a gaggle of expanded and torn material, and bent and stretched parts. Such results are the mechanics of air entering the blade cross-section through the front of the leading edge erosion shield and projecting extreme air pressure.

The inspection did not identify the manner of the entry of air through the leading edge erosion shield (delamination, erosion or projectile contact). This identification required the examination of the missing separated blade that includes a small (2.75 inch) portion of the leading edge erosion shield delaminated from the remaining end of the damaged blade.

Critical Flight to Emergency Landing

N311VT's rotor disk successfully flew the critical period with one (1) blade shortened by about nine (9) inches and with its tip damaged; plus four (4) fully service blades. The rotor disk suffered eccentricity of its centroid but it continued to provide the necessary lift forces and the forces for aircraft control. Within the disk, the kinetic energy was eccentric to induced distortion such as lade separation and transmitted enormous amounts of energy into the airframe.

Part Six

Other damages found by the post extraction inspection were classified as collateral damage.

Damage - End Plate, Right End Horizontal Stabilizer, attached Photo #01, #03 & #04.
Collateral Damage: Separated main rotor blade tip deflects off the vertical stabilizer and damages the end plate. The damage on the vertical stabilizer damage is shaped like a saddle for the separated blade tip.

Damage - Vertical Stabilizer, top, attached Photo #01 & #05.
Collateral Damage: Hit and deflection by separated blade tip.

Damage - Tail Rotor Blades, Two (2), attached Photo #01 & PIC-B N311VT.
Collateral Damage: Tail rotors damaged by bush and shrubbery during the touchdown of emergency landing.

Damage - Airframe, attached Photo #01.

Collateral Damage: Internal damage to one (1) main rotor blade made the main rotor disk's centroid and kinetic energy eccentric. This condition transmitted to the airframe stressing movements and energy. Without disassembly, the extent cannot be determined.. The assessment after close examination is considerable airframe damage.

Reference: ADDENDUM
 Pilot/Operator Aircraft Accident Report
 Helicopter - N311VT
 NTSB Form 6120.1

ATTACHMENT.05

Recommendations

A. The emergency landing of N311VT was made on decision of the Pilot-in-Command (PIC). The post extraction investigation and inspection corroborated the PIC's judgment, decision and execution.

B. The findings of fact reasoned the mechanical malfunction/failure is the cause of the need for the emergency landing , see Attachment.04, "Mechanical Malfunction/Failure".

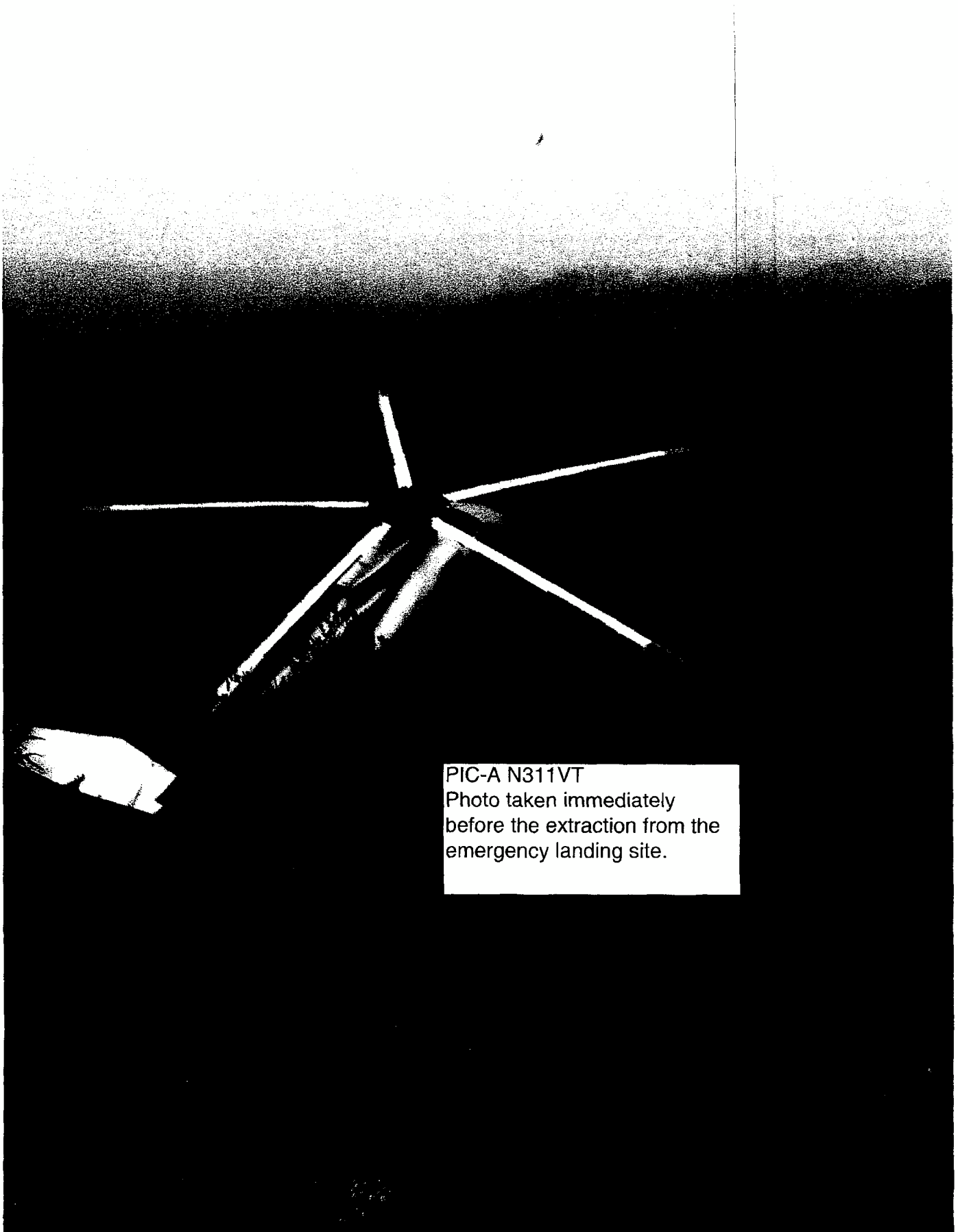
C. Debriefing the procedures of the operation and emergency landing identified the three additions to the current Pilot's standard operating procedures.

1. Pre-flight Aircraft Exterior Check: The check of the tail and main rotor blade's leading edge protection tape shall be a requirement of the preflight checklist as an individual and separate listing.

2. Flight in 'Rear Doors Off' Configuration: All material or item loaded on the floor for a flight in the 'Rear doors off' configuration shall be required to be physically secured to a tie-down fixture to prevent movement and loss from the cabin.

3. Unimproved field loading and departure procedures: In operations that require the pilot to continually remain at the flight controls, clearance is an advisory of the ground crew. The pilot shall validate the advisory with routine signal or voice communications reports on individual item, function or procedure.

D. The recommendations of paragraph C., above, has been added to the Pilot's operating procedures.



PIC-A N311VT
Photo taken immediately
before the extraction from the
emergency landing site.

037.JPG

Open with



PIC-B N311VT

Photo taken during the extraction. Some vegetation was cut to expose and free the tail section for extraction.

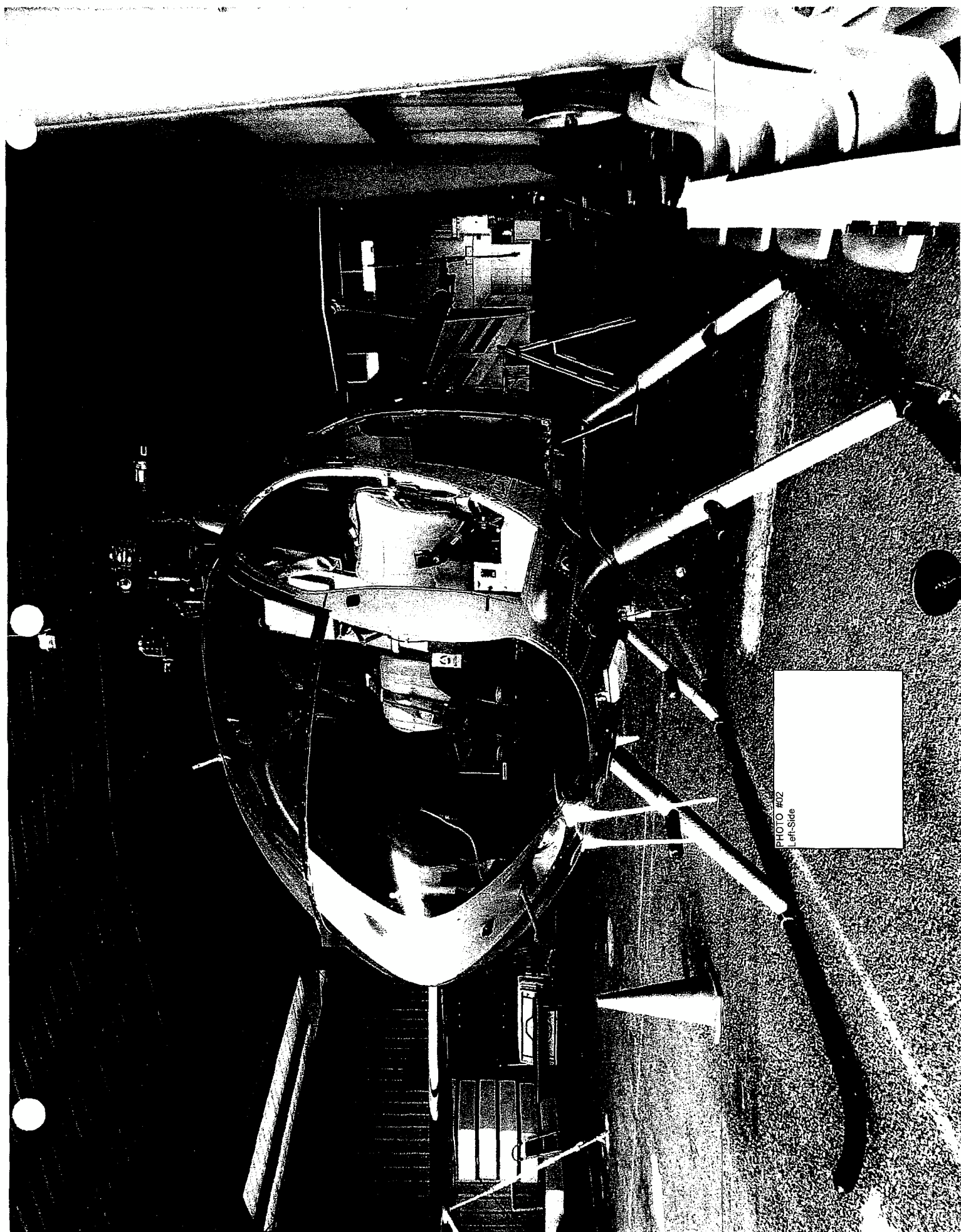


PHOTO #02
Left-Side

#1
END PLATE, right-bottom

#2
VERTICAL STABILIZER, top

LINE DEPICTS
RELATIVE
ALIGNMENT

#4
TR BLADE, tip (both)

ARROWS POINT TO
Skin Wrinkles,
Popped rivets, Skin
ILifts

PHOTO #01
Right Side

ELECTRICAL
CARGO HOOK

#3
MR BLADE, one (1) ea
(one blade only damaged)

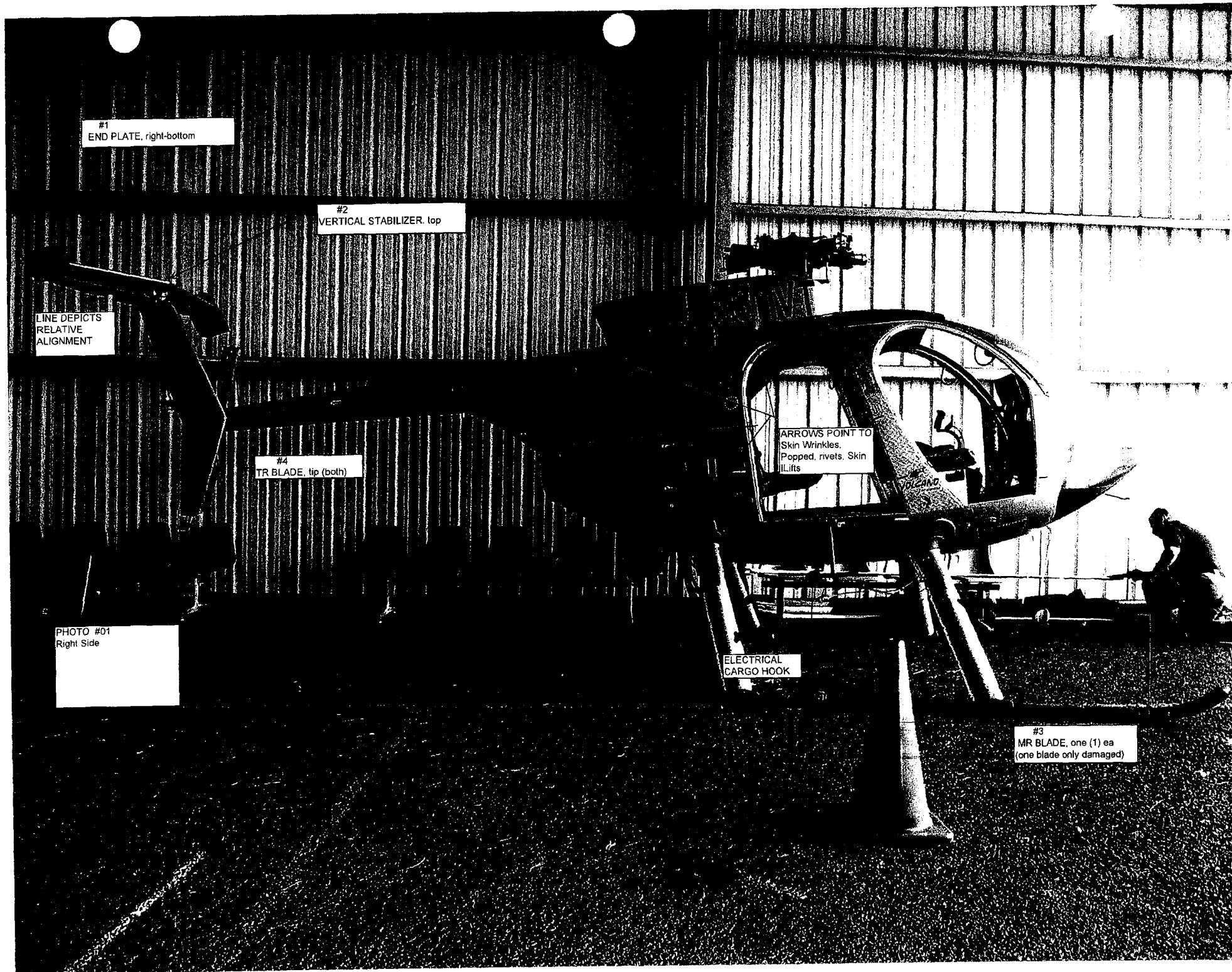
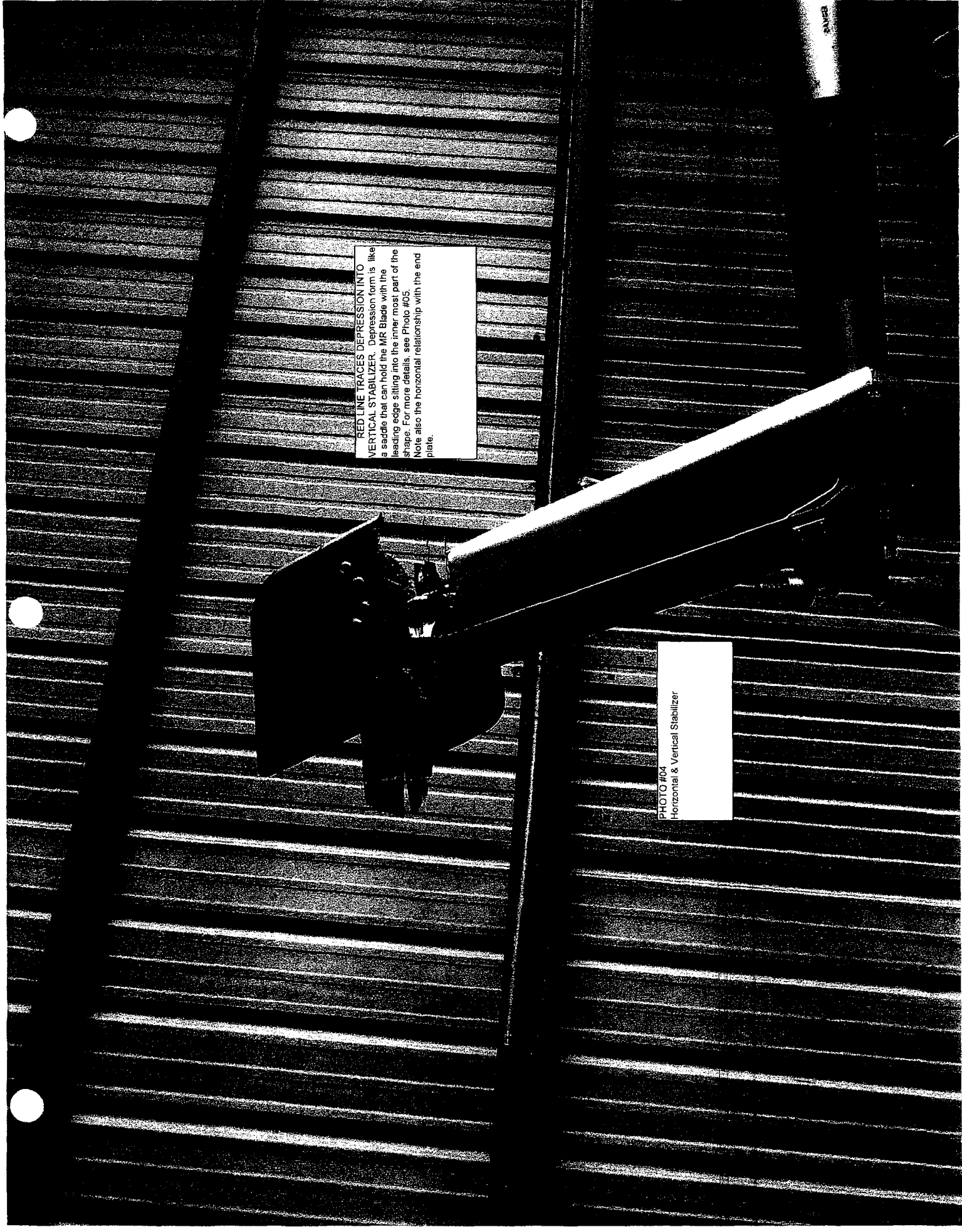


PHOTO #03
Horizontal Stabilizer End Plate, Left

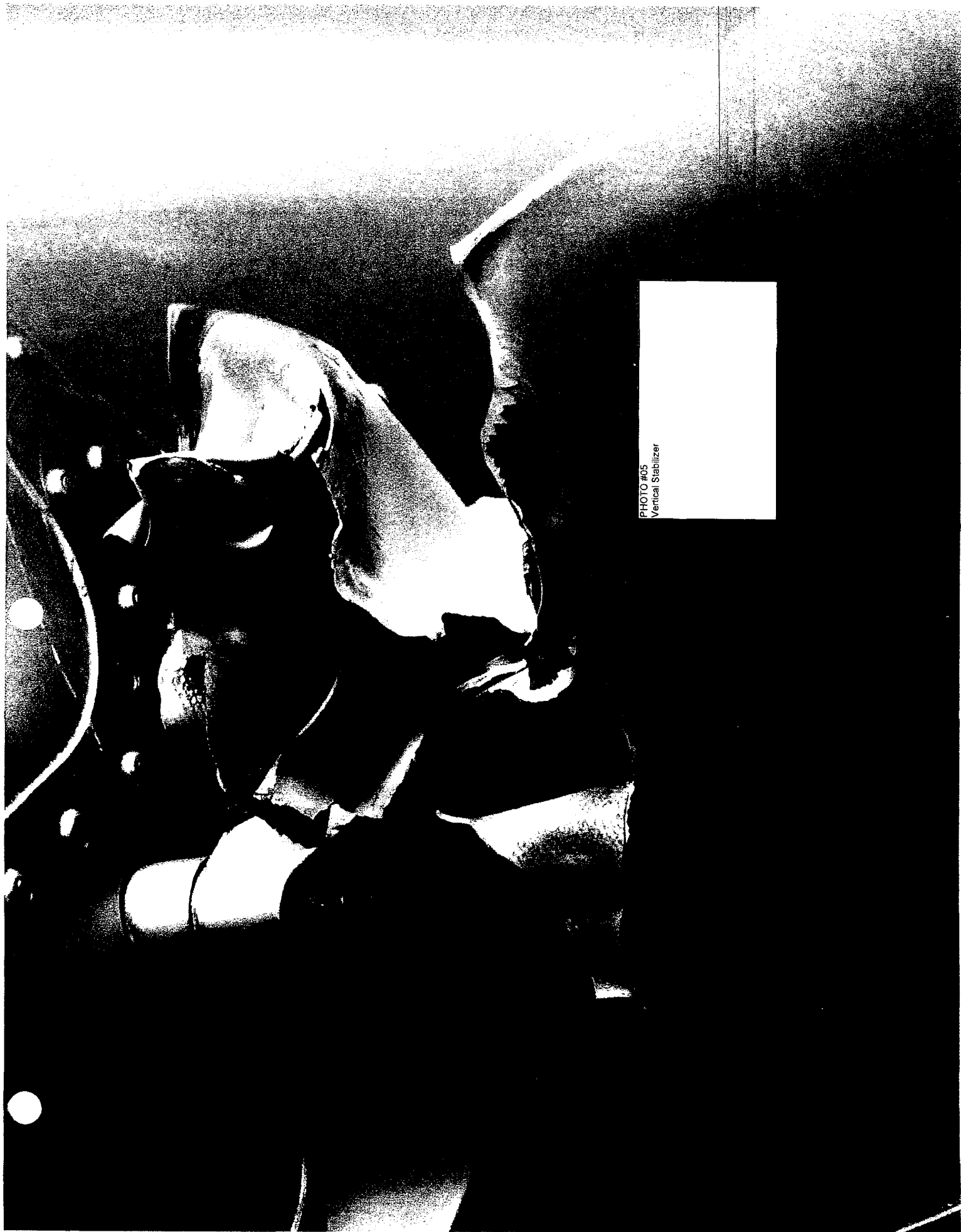




RED LINE TRACES DEPRESSION INTO
VERTICAL STABILIZER. Depression form is like
a saddle that can hold the MR Blade with the
leading edge sitting into the inner most part of the
shape. For more details, see Photo #05.
Note also the horizontal relationship with the end
plate.

PHOTO #04
Horizontal & Vertical Stabilizer

PHOTO #05
Vertical Stabilizer



STA 124

STA 130

STA 142

PHOTO #06
MR Blade, top view



PHOTO #07
MR Blade, End View



PHOTO #08
MR BLADE: Back View

APPENDIX