The misconceptions of the accident investigation by Japanese Aircraft Accident Investigation Commission (AAIC) and the analysis by ALPA Japan.

Let's point out, the serious misconceptions involved in the Accident Investigation Report, from a technical viewpoint.

- The AAIC report concluded that < the captain pulled the control wheel to inhibit an increase in airspeed and disrupted the autopilot, thus causing a sharp nose-up motion > <the up-and-down motion of the nose after the autopilot was disconnected, were caused by the captain repeatedly pushing and pulling the control column in an attempt to recover the pitch attitude of the aircraft>. (Caution: override is meaning to apply intentional force to the control column while the autopilot is engaged). But the captain testified that he did not apply such intentional force to the control column, neither there is evidence of intentional disengagement of the autopilot.
  We assume that the accident was caused by the compound reaction of the following: the flight characteristics of the MD11, the aerodynamic effects of the speed brake, the complex changes of the atmosphere due to the strong inversion layer.

The abrupt nose up did not occur as a result of disengaging the autopilot, but rather the autopilot was disengaged after the abrupt nose-up motion occurred.

- The AAIC report concluded that the captain pulled the control column to manage the increased speed beyond the preset speed of 350 kts. By strongly pulling the control column toward the pilot, the autopilot disconnected automatically and rapidly brought up the nose.

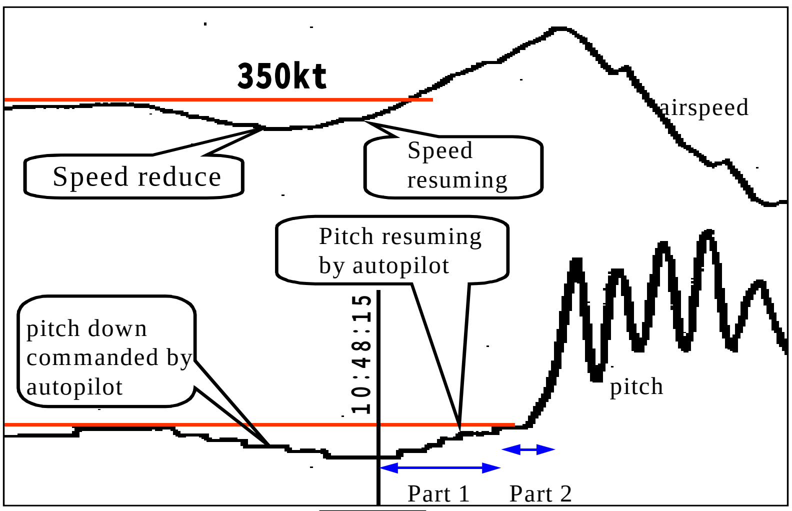

Fig-1

As shown in Fig.1 on the left, the pitch increase starts in the beginning with a slow rate (Part 1), followed by an abrupt one (Part 2).

This continuous pitch movement is reported as a result of the captains intentional pulling of the control column. However ALPA Japan is assuming that the pitch increase of part 1 and part 2 are caused by different factors. As for part1, at first a pitch decrease was commanded by the autopilot, ahead of the pitch increase command. There was an airspeed deceleration due to a wind change. The autopilot pitched down to accelerate to the commanded speed. As the airspeed returned to its commanded value, the autopilot gradually started to pitch back up.

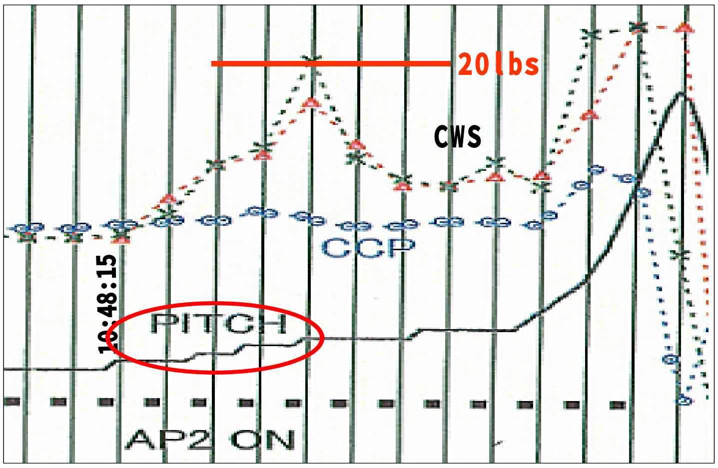

Fig-2

Fig. 2 on the left, which is the AAIC report, is showing only the right half of the graphic above (Fig.1). It only shows the part where the pitch already started upward, thus indicating an intentional pulling of the control column by the captain. In fact it was a pitch up commanded by the autopilot.

Moreover, recorded force, applied to the control column at that time, is lower than 20lbs. According to the McDonnell Douglas technical information, applying a force of less than 20lbs, will not cause the nose-up motion. So, it is obvious that the pulling of the control column, did not cause the nose-up motion.

- Let's explain the part 2. On the pitch data record, extracted from the AAIC report, the abrupt nose-up motion began about three seconds before the autopilot was disconnected. Moreover the nose-up motion was started, before the elevator was moving. This indicates that the pilot's operation was not the cause for the nose-up motion.
- Now let's explain the reason for this abrupt nose-up motion.

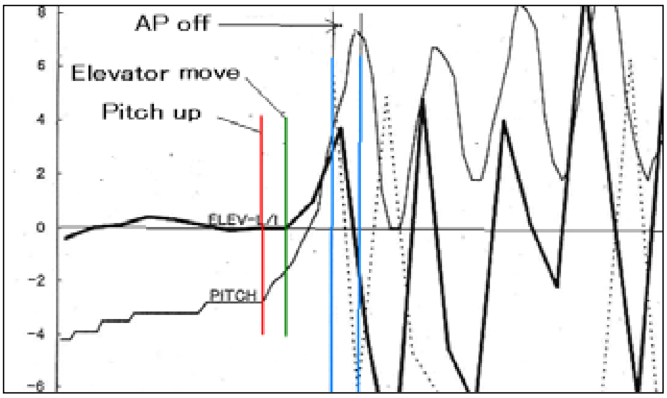

Fig-3

~We conducted experiments to assume the reason for the nose-up motion~
Use of the speed brake promotes a nose-up tendency.

- Compared to other types of aircraft, the pitch stability of the MD-11 type aircraft is not enough. A LSAS (longitudinal stability augmentation system) is installed, which is a device, used during manual control, to increase the stability of the pitching motion of the aircraft. The LSAS is one of the functions of the FCC (flight control computer).

- By deploying the speed brake, a remarkable nose-up tendency will be promoted, which will be normally rectified not to do so, by the autopilot or the LSAS. If the autopilot or the LSAS malfunctioned, how much nose-up motion will occur by deploying the speed brake.
- For this experiment, ALPA Japan used the simulator. As a result of the experiment, almost the same pitch up movement as on the JL706 was confirmed when speed brake was deployed with no autopilot nor LSAS functioning.

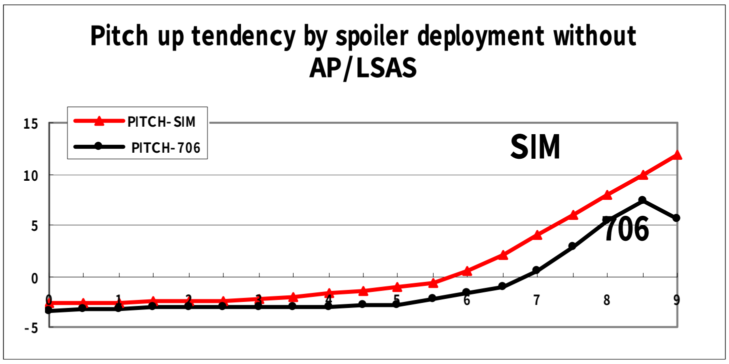

Fig-4

Did the autopilot or the LSAS fail to function properly.

- In normal condition, the autopilot or the LSAS will cope with the nose-up motion and stabilize the aircraft, even if the speed brake is deployed. The FCC is always using the atmospheric data in which the aircraft is surrounded, to calculate and determine the commands for aircraft stabilization.
- However, if there is a rapid change of the surrounded atmospheric condition, the calculation cannot be completed timely due to saturation of CPU, thus causing an intermittent malfunction of the computer. This is the same situation as <freezing>, if we make many things do at once with our personal computer.

The CPU (central processing unit) of the FCC used in MD-11, is about 20 years older than the CPU in our present personal computers.

Unstable airflow in inversion layers

- At just around the altitude, where the sudden nose-up motion started, the atmospheric data indicates a strong inversion layer. However the AAIC does not take this fact into consideration. Inversion layers exist, where rapid temperature change is observed, and it is known to easily generate disturbed airflow.

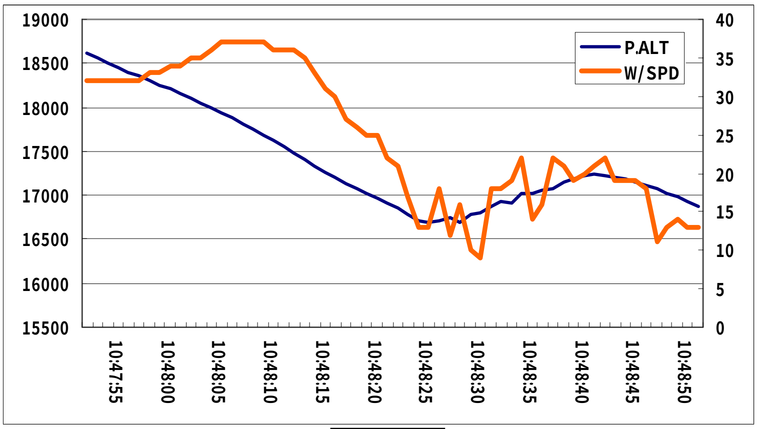

Fig-5

- McDonnell Douglas admits that there was a rapid change of airflow exceeding the limit designed for the autopilot. It is beyond understanding, why the AAIC does not take this into consideration, even if the manufacture company of the airplane, admits the rapid airflow change, exceeding the designed limit.
- How turbulent was the air ,surrounding the aircraft. As one of the examples, Fig.5 indicates the change of the wind speeds at the time of the accident.

  The orange line shows that the wind speed has repeated increase and decrease violently. Such changes indicate the existence of a vortex in that specific area, and it also indicates an overloaded situation for the computer calculation.

- That the computer was overloaded and malfunctioning, can be supposed also by the captain's testimony. He testifies that the autopilot did not respond to his nose-up command.
- There are also other evidences indicating FCC malfunction.
  For passenger's comfort, the MD-11 has a so-called G control function, which protects the aircraft from being loaded with excessive G during flight. Moreover, there is also a function to adjust the angle of a horizontal stabilizer according to a deflection of an elevator, and both functions are controlled by the FCC.

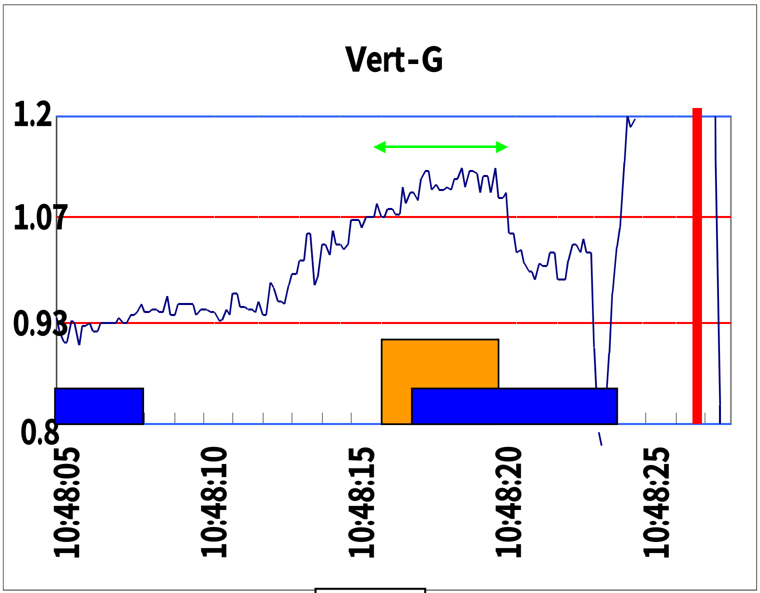

Fig-6

Fig.6 on the left shows the duration that G-force loaded on the aircraft and the deflection of the elevator were out of limit. The G-force, shown with the rugged line, is out of the limitation shown with the two red lines, where indicated by the green arrow. The time zone shown with the blue belt is showing when the horizontal stabilizer was out of the suitable position. The time zone with the brown belt is showing when the autopilot did not react, in spite of the captain's command.

- Taking all these things into consideration, it can be assumed that the FCC, which commands the autopilot and LSAS, was overloaded due to the turbulent airflow surrounding the airplane, and stopped functioning temporarily. Subsequently, an abrupt nose-up motion began by deploying the speed brake at the same time. About the continuing pitch oscillation will be explained later.

Why was the autopilot disconnected

- The AAIC report only mentions," the reason why the autopilot was disconnected is that the captains pulled the control column." nevertheless, the Aircraft Operating Manual for the MD11, lists the following four conditions for disconnecting the autopilot.

① Excessive G in vertical direction (air turbulence)
② A rapid rolling of the aircraft
③ Excessive inclination bank angle of the aircraft
④ Remarkable deviation between the position of the elevator commanded by the autopilot and the commands from the FCC.

* This function was originally designed to enable disengagement of the autopilot, in case of autopilot malfunction. To accomplish this an overriding force of 50 lbs (22.5 kg) must be exerted for more than one seconds on the control column. However at the time of the accident, the captain was using his right hand to control the speed brake, and to accomplish a force of 50 lbs (22.5 kg) only with his left hand is of great difficulty.

The remaining failure record of JL706 is showing that **no4 condition has occurred, which indicates that the elevator did not respond correctly to the FCC's command.**

We investigated the cause for the autopilot disconnection.

- We have pointed out the possibility of the computer to stop its function temporarily, which is caused by the turbulent air surrounding the aircraft. The simulator experiment proved that the autopilot is disconnected, 2-3 seconds after the FCC stops its pitch control function temporarily.
- The FCC has a BIT function (self-monitoring device), which continuously monitors the operating state of the computer. When the BIT function of the FCC detects any faults, the hydraulic pressure to operate the elevator will be shut off, thus disconnecting the autopilot.
- Moreover, disconnecting the autopilot in this way, a failure record of <CRM> is recorded, which is the same record as the one of JL706.

- We mentioned that there was evidence of FCC malfunction just prior to autopilot disconnection. If we assume that this malfunction was detected by the BIT function and caused the autopilot disconnection, rational explanation is possible, for the time and cause of the autopilot disconnection, the atmospheric condition, and the subsequent aircraft motion.

Now, let's verify the cause of the continuous pitch oscillation.

- The AAIC report is recommending an improvement of the autopilot to prevent reoccurrence of the accident.
  It is recommended that, improving should be made so that a rapid posture change of the aircraft may not be brought about, even if an autopilot is disconnected.
  The AAIC considered that accident, involving abrupt attitude changes caused by intentional force override by the pilot , can be prevented by improving the autopilot system.
  However, since its appearance in service, the MD11 aircraft has experienced several accidents with unusual pitching motion of the aircraft. To prevent this pitching motion, improvements of the autopilot system were made on and on , like the **PRD (pitch rate damper)**,a function to prevent abrupt pitching motion. **All concerning improvements had already been completed as for the aircraft of the JL706 accident.**
- Thus, all concerning autopilot improvements to prevent abrupt pitching motion, were completed, the recommendation of the AAIC was a completely useless measure. It is obvious that the conclusion of the AAIC report, itself, was a misconception and that the unusual pitching motion of the aircraft was caused by something other than the pilot's control.

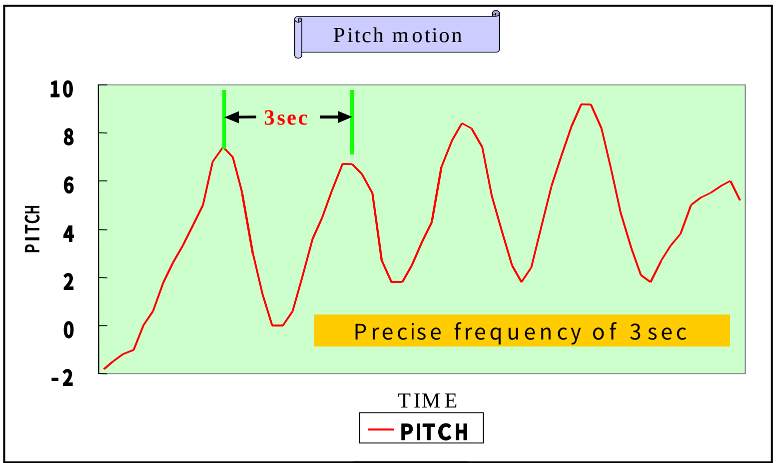

Fig-7

- As it is shown in Fig.7, the repeated up-and-down motion at the time of the accident has a short cycle of about 3 seconds. Moreover, it has a wide up-and-down amplitude of 8deg (a cockpit up-and-down motion of 5-7m), and was repeated with a **very accurate frequency** for 5 times.

＊ The up-and-down motion is impossible to reproduce artificially.

- To create an up-and-down motion artificially by pushing and pulling the control column, was experimented using the simulator. However, it was unable to reproduce such repeating pitching motion. As explained previously, the PRD, which was installed to stabilize the pitching motion, stopped the pitching motion immediately.

- The AAIC admits in the accident investigation report ,that they were **unable to reproduce the repeated pitching motion** as experienced during the accident.

- Concluding, that the violent up-and-down motion was caused by the pilot who pushed and pulled the control column, even though it cannot be artificially reproduced, is far from a scientific accident investigation.

Why did the unusual attitude change happen to flight 706?

- We are focusing to the motion of the speed brake, a drag device installed on the main wing.

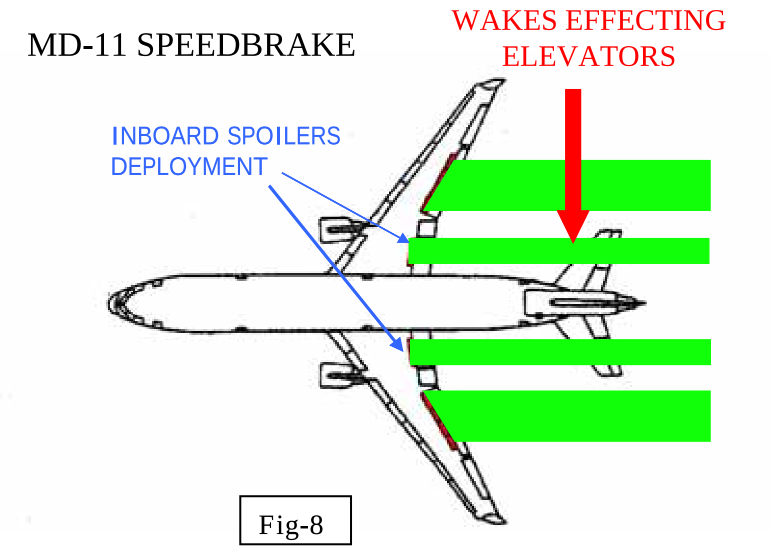

Fig-8

- There are several speed brake panels installed on the main wing (Fig8). Unlike other types of aircraft, all the speed brakes panels of the MD11 type aircraft, are fully deployed including the inner brakes (most close to the fuselage) during flight.

- Wakes from these inboard speed brakes, specific to the MD11, is usually designed not to affect the flight. However, as for the JL706 affected by the vertical vortex in the inversion layer, there is possibility that the wake from the spoilers did adversely affect the horizontal tail.

①Deploying the speed brake has a tendency to pitch up. However in normal condition, this will be coped by the autopilot or the LSAS.
②If the horizontal tail is within the wake generated by the speed brakes, it reduces the efficiency of the elevators. Consequently, the elevators are unable to cope with the pitching motion.
③ According to the AAIC report of JL 706, the abnormal nose-up motion and the subsequent pitching motion began almost simultaneously with the deployment of the speed brake, and terminated soon after closing the speed brakes. It is assumed that there is a causal relationship between the speed brakes and the pitching motion.
④ If we look into the pitch attitude changes in detail, the four pitching motion during the speed brake deployment have exactly the same tendency. It can be said that they

were caused by the same reason. A human cannot achieve this same tendency.

＊ We assume the cause of the up-and-down motion.

- According to these conditions, as explained previously, it can be assumed that the abrupt up-and-down motion was a result of the following:

①FCC malfunction occurred, due to strong inversion layer involving remarkable wind change.

②Pitch-up motion was started by deploying the speed brakes for airspeed reduction.

③Disturbance of the air current passing through the speed brakes affected the horizontal tail and significantly reduced the efficiency of the elevators. Consequently, the elevators were unable to inhibit the nose-up tendency resulting from the use of the speed brake, thus leading to a sharp nose-up motion. At the same time, the BIT function detected a fault in the FCC and disconnection the autopilot.

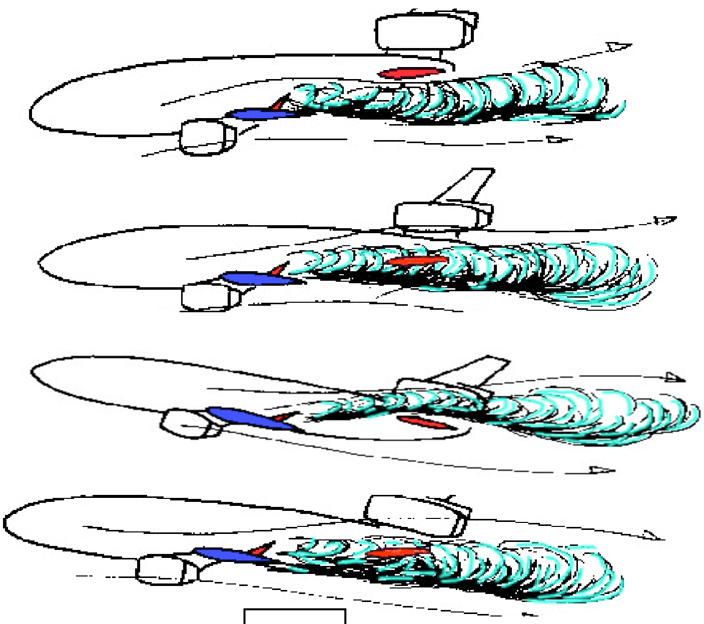

Fig-9

④When the elevators and the horizontal stabilizer are no longer affected by the wake that was caused by the use of the speed brakes, as a result of a relatively sharp nose-up motion, the elevators quickly recover and the nose-down motion begins...

⑤However, when the nose is lowered, the elevators are affected by the wake again, and the nose-up motion begins again, thus being unable to control the attitude.

⑥After closing the speed brakes, the wake disappeared and the aircraft regained stability.

- At a first glance at the DFDR record, speed brake is a factor having close relation with the pitch change, however the AAIC shows no evidence of investigation made into the aerodynamic effects of the speed brakes.

Accident regarding flight characteristic of MD11 occurred

- World widely, MD11 is an aircraft, which has a high incidence of accident. Many of the accidents have occurred in relation to the flight characteristic.

- On July 31, 1997, a MD11 operated by Federal Express was overthrown at the time of landing at Newark, United States. Furthermore, on August 22, 1999, a MD11 operated by China Airlines was overthrown at the time of landing at Hong Kong.
- NTSB, which is the accident research institute in the U.S., which conducted these accident investigations, says, "The automatic pilot of MD11 cannot be admitted."

Same nose-up motion like on the JL706 occurred on other JAL flight

- Nine months after the accident of JL706, three cases, just like the JL706 accident, occurred with JA8580 (the same aircraft of JL706), in which a rapid nose-up motion occurred after the autopilot was disconnected automatically. With all the three cases, no force was applied to the control column; nevertheless failure record of<CRM>was recorded, as it was on JL706.
- Although we asked the AAIC to investigate these three cases as a reference example, the AAIC refused to investigate due to "no reason for it".
- Moreover, subsequently, in the talks with the crewmember's association, the AAIC is making a surprising remark. "We do investigation regarding regulations and flight operation, but we do not make investigation regarding the design and performance of the aircraft, because "it may involve problems of diplomatic concern”. From this remark, it can be well assumed that Japan's accident investigation seems to investigate only from a viewpoint of "an artificial mistake.”
- Against such inadequate investigation, the JAL captain's association pointed out these concrete points, which are doubtful and contradicting, and asked for re-investigation. However re-investigation is stubbornly resisted, since the investigation had been completed by issuing the investigation report.
- However, NTSBhas conducted several re-investigations about past accidents, and has corrected the finding of fact and the presumed cause.
- For example, at the beginning in 1986, the cargo door of a United Airlines 747 blew away in Hawaii. Although NTSB released a report that the door was not completely locked before the flight, after one and a half year NTSB is correcting it and reported, that a defect of the switch or it's wiring of the door lock motor, has caused a unintentional operation. The re -investigation was conducted after collecting the cargo door from the seabed.
- If a misconception is found in a report, re-investigation should be started immediately. Investigation for the true cause, and to prevent a reoccurrence of the accident, is the important duty to accomplish, for the Japanese AAIC.