Korea Aviation voluntary Incident Reporting System

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KAIRS Report / ASRS Report / CHIRP Report
Aviation Communication / Expert Contribution

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Editor's Note

You know you have been through tough days
in your life.
On such days, you just have to lower the anchor
and put your work aside.
As your work is also like sailing a boat, you should
never go against the high waves and severe winds.
My love, there's nobody who has never been hurt.
When the cold winter finally ends, warm days
will come, and bloomy winds will blow by.

From the poem entitled "Spring will come to you" by Jonghae Kim

Dear GYRO readers,
How are you doing during this unexpected novel coronavirus crisis? COVID 19, which was first dentified on December 1, 2019 in Wuhan, has spread around the world and within Korea, and all of us are paying attention to the number of confirmed cases and deaths reported in the media, with the anxious worry we could also be victims of this disease. Although we are not through these cold, winter-like tough days yet, I believe that in the end we will get through this crisis, like flowers that bloom in spring. I hope all of you will return to your normal lives soon.

In this issue, cases related to standard instrument departure procedure, emergency declaration related to the aviation weather and inappropriate air traffic controller instructions will be covered. In addition to these, US ASRS report cases and UK CHIRP cases will be introduced. As well, starting in this issue, a new regular feature on ATC radio communication and an expert contribution have been added.

Thank You.

*** How to submit an aviation safety report :** Visit [Voluntary Incident Report] at www.airsafety.or.kr, and then click [Voluntary Report] - [Submit Voluntary Incident Report]

KAIRS Report

Standard Instrument Departure Procedure

〈Report content〉
The aircraft (B738) started go-around (21:15, local time) due to an imbalance during the approach for landing to runway 00L at 00airport. Serving as the controller, I thought that B738 would take off with no problem in a VMC situation, and issued the departing aircraft (A321) permission to take off on runway 00R. When I recognized the go-round of B738, A321 was already taking off.

The standard instrument departure procedure towards runway 00R at 00airport was set to turn left (from 153 degrees to 138 degrees) after takeoff, which might cause a close encounter with B738 going around, so I instructed B738 to turn left (to 120 degrees in my first instruction and to 90 degrees in the 2nd instruction). In addition, I instructed the departing aircraft to maintain its nose towards the runway (at 153 degrees) instead of performing the standard instrument departure procedure to prevent a close encounter between these two aircraft. Regarding the close-proximity runway operation procedure at 00airport, it is specified in the internal operational rules that independent operation is allowed between taking off and landing aircraft if the controller is able to identify the aircraft and separate them properly. However, based on what I experienced in this case while simultaneously controlling the go-around aircraft and the departing aircraft, given the situation awareness, consequential issuance of instructions and the traffic complexity (request for clearance from the approaching aircraft during control for safe separation), the design limits for the standard instrument departure procedure toward runway 00 at 00airport (possibility of close encounter with the go-around aircraft on the proximity runway when turning left after takeoff) appears to impose a huge burden on the controller. The controller is required to keep in mind the possible go-around of the landing aircraft and be ready to take appropriate action to properly separate the go-around aircraft from other aircraft, and the pilot should read back after the controller gives instructions and promptly follow such instructions to ensure flight safety.

• KAIRS Opinion :
The above report describes a case of a missed approach procedure in which a departing aircraft and a landing aircraft were involved. The controller should issue a departure clearance to the departing aircraft only after the landing aircraft touches the runway, and always be aware of the possibility of unexpected events such as a missed approach of the landing aircraft to prevent similar occurrences.

When training controllers, it is necessary to indoctrinate them in precautions and ountermeasures, focusing on the fact that the direction in the takeoff procedure is similar to that in the missed approach procedure.

KAIRS Report

Emergency declaration related to the aviation weather

〈Report content〉
It was not specified in the weather information delivered from the air traffic control unit of Da Nang airport before the first approach that there would be moderate rain, but there was moderate rain below 1,000 feet while approaching runway 35R, so I started go-around, as the visual reference, which is one of the requirements for CAT I approach and landing, was not secured at the minimum altitude.

At the first approach, it was identified on the radar that a cluster of rain clouds was moving from west to east, and it was a temporary moderate shower, of a type that is common in Southeast Asia. At the second approach, the moderate rain was downgraded to light rain and the air traffic control unit announced that visibility was improving, so a decision was made to try another approach. However, as the weather was still in a moderate rain state and the visual reference was not secured at the minimum altitude, another go-around was made. But at the second approach, a clear sky was visually confirmed to the west of the airport, and at the third approach, it was judged that clear weather would be secured during approach and landing. At the second go-around and missed approach, an instruction was received from the air traffic control unit to return to the alternate airport since the airport regulations specify that any aircraft conducting go-around 2 consecutive times must return to an alternate airport (I have never heard of such regulation before).

The PIC notified the controller that he was not planning to return to an alternate airport, but the air traffic control unit kept repeating that they would not grant clearance for our third approach. So, the PIC told the controller that he would have chosen holding or returned to the alternate airport if he had known that only 2 go-around attempts were allowed. Nonetheless, the controller instructed the PIC to return to the adjacent PHU BAI airport, and the PIC replied that he was not allowed to return to said airport because the Jeppesen chart for PHU BAI airport was not available at that time, and that the airport was not one of the company alternatives. In such process, additional fuel was consumed, and we found that we would be in a fuel emergency situation if we needed to return to the alternate airport (HANOI) filed in the flight plan.

As a last resort, the PIC declared an emergency to request Da Nang airport for clearance for approach and landing (the controller told the PIC "go to PHU BAI or declare an emergency," and the PIC declared an emergency to the controller and told him that he would land at Da Nang airport. So, in a way, the PIC declared an emergency with mutual consent). At the third approach, rain had stopped as expected with a clear sky, and a visual reference was clearly secured. After this, we landed at the airport and ramped in successfully. At the time of go-around, the PIC and the purser promptly delivered an in-flightannouncement to the passengers via the PA, and there were no complaints received from passengers after they were deboarded. After ramp-in, the PIC was expecting a call from the airport authorities for an interview, but there was nobody from the air control except for a small number of ground personnel. Even the airport branch office did not receive any message from the airport authorities. The next day, the PIC confirmed with the manager of branch office at Da Nang airport that no call was received from the air traffic control unit.

Pursuant to Clause 8, Appendix Table 2 (range of aircraft serious incidents) Enforcement Regulation of the Aviation Safety Act and Clause H of FOM 16.7.2, the PIC was required to fill out an ASR as he had declared an emergency due to lack of fuel or fuel distribution disorder (which refers to such cases as insufficient fuel, fuel exhaustion, fuel deficiency due to leak or unusability of available fuel). However, 3,260kg of fuel remained in the aircraft at the time of ramp in, and the actual reason for declaring an emergency was not fuel deficiency.

Thank you.

• KAIRS Opinion :
The case reported above is a fuel-related incident, in which not only organizational hazard resulting from operational policies/procedures such as Da Nang airport's operational rules which specify that an aircraft with 2 consecutive missed approaches shall be diverted to an alternate airport, but also an environmental hazard with an expected fuel deficiency situation consequent to adverse weather conditions were involved.

We are sharing the operational and administrative rules of Da Nang airport so that you can be informed of them and prepared.
⋯› In case you were not aware of the operational rules of Da Nang airport, when you approach Da Nang airport or you have to perform a go-around as a weather reference of CAT I or below is not secured, it appears to be necessary to conduct the landing procedure again after the PIC's deliberation, such as staying in the air for a certain period of time. It also seems necessary to establish alternate procedures such as adding more alternate airports through consultation with the company or securing charts. Given that Da Nang airport has a concentration not only of low cost carriers but also domestic passengers, the Vietnamese government should secure and share the standard operational procedures of Da Nang airport with airlines.

KAIRS Report

Inappropriate control instructions

After contact at OOAPP 124.1, I was notified of Radar Vectoring ILS Runway 18 and then instructed to descend to 2,400 feet.

APP : XXX111 HDG 200 DESCENT 2,400
PILOT : XXX DESCEND 2,400 HDG 200
(I felt like the airplane would establish on the localizer at 8DME from the end of the runway)
PILOT : CONFIRM CLEAR FOR APP?
APP : .....DID YOU SEE THE Runway?
PILOT: (the pilot asks again since no ILS clearance was issued even after the moment for GEAR DOWN had passed) CONFIRM CLEAR FOR APP?
APP : DID YOU SEE THE Runway? (the controller asks again, without issuing clearance)
PILOT : (the pilot says that he can see the runway, while turning the nose to Runway HDG 176 so as to be cleared for ILS as he has never approached OO Runway18 at night) RW IN SIGHT XXX 111
APP : ROGER CONTACT TOWER 126.5

It was when I was at 6DME from the end of the runway, and I let down landing gear with landing FLAP to avoid a go-around for instability. After checking the checklist, I made the glideslope capture at 1,200 feet. Even though I am not sure whether it was their procedure to control military aircraft, the approach control confirmed Runway Insight and immediately handed me off to the TOWER without clearance for precision approach to a civilian aircraft in IFR(Instrument Flight Rule). As a result, it was difficult for me to follow the SOP set by altitude speed for normal approach, and I almost started a go-around due to it being an unstabilized approach at night over an airport where bird strikes often occur.

The control instructions from the controllers at OOairport, which are different from our domestic controllers, seem as though they might continue to cause unsafe hazards in the future. For this reason, this case should be shared so that pilots can be prepared when they are approaching OOairport.

• **KAIRS Opinion :**
The case reported above is an incident of a hazard resulting from following non-standard air traffic service procedures given by a controller. According to the analysis results, human factor-driven hazards were generated. Hazards identified in this case are as follows.

Despite the request for ILS clearance from the pilot, the controller provided instructions in favor of his/her own convenience for quick control transfer. In this case, the pilot's workload was increased due to the lack of issuance of ILS clearance and unstandardized instructions from the controller. In particular, as the pilot's workload is relatively high in the stage of approach and landing, the controller should follow standard air traffic service procedures and provide clear instructions to the pilot. The pilot even needs to ask the controller to give clear and standardized instructions if he receives instructions that are not clear, or can be misinterpreted.

" Call Back "

From NASA's ASRS (Aviation Safety Reporting System)

The "Whether" of Winter Weather

Winter weather produces a diverse set of conditions, concerns, and potential dilemmas for all aviators. While conditions may be common to all, not all pilots or aircraft are affected equally. Aircraft are designed with differing capabilities, and pilots bring a wide range of experience to the cockpit. Regardless the type of aircraft you fly or your experience level, winter weather operations demand diligence.

Knowledge, strict adherence to procedures, planning, and sound judgment are required to operate safely, and under some conditions, operations are illadvised or prohibited. CALLBACK recounts ASRS reports that focus on basic, universal issues as applied to cold weather operations.

In these reports, unanticipated weather phenomena, incomplete knowledge, and details that were overlooked all contributed to decisions that had significant consequences. The actions and consequences stemming from those decisions reveal some good lessons and cold weather wisdom.

ASRS Report (Call Back)

Clues Amidst the Mist

A Cessna 208 pilot took quick action when confronted with conditions that were not as expected. Light rime ice experienced in the descent was no longer present, but a more hazardous environment had developed.

■ I had been assigned a charter to fly…early in the morning.… I departed…without incident or concern, and shot the RNAV approach…at [my destination]. In the descent, I picked up some light rime [ice], right on the leading edge, but nothing that was incredibly significant. I broke out…approximately 50 feet above minimums, in 8 to 9 miles visibility, and landed without incident. After removing the ice, we taxied back [for takeoff]. As I was turning around and taking off, I noticed…some mist moving toward the airport off the hills toward the south. During climb out on the Obstacle Departure Procedure (ODP), everything began as normal, but quickly the plane decelerated from 105 knots to 90 knots during climb out. Upon reaching 300 feet AGL, the plane was climbing at 100 feet per minute with significant ice buildup behind the protected area. I knew that, at the current rate of ice accretion, we would never reach where the tops were (3,000 feet).

Even though I could not [advise] ATC due to low altitude and poor radio reception, I had to [evaluate conditions] myself. Looking back, I could still make out the airport and the hill beside it, and made a snap decision to turn back and land. We landed without incident.

[This] is absolutely the fastest I've ever seen ice accumulate. The only suggestion for myself is that, if I see some sort of light mist…like that again and the temperatures are close to or at freezing, I may delay takeoff.

ASRS Report (Call Back)

VFR Requires VMCs

A C182 pilot diligently checked the weather and devised a plan to conduct this VFR flight. The plan did not progress as expected, and a situation developed that typically results in additional hazards during cold weather operations.

■ This mission was to transport a…client to OOO. Also onboard was a non-pilot friend. I had been studying the weather the night before and realized fog was predicted by using my ForeFlight App. Before departure, I reviewed the weather again. The forecast had improved slightly, with Marginal Visual Flight Rules (MVFR) expected [later] at OOO. My hopes were that clouds would be at least broken by the time I reached the arrival area with ceilings at 2,500 [feet]. We departed expecting a 2 hour, 10 minute flight, thus arriving…as conditions were improving.

I contacted ATC and initiated Flight Following after hand-off from [the departure airport]. Upon passing [an airport] I noted broken clouds ahead and mostly overcast to the east. I chose to fly slightly west to stay on the margin where clouds were broken.… I began a VFR descent to 2,500 feet MSL to get under the deck. Initially, the base of the clouds was 2,500 feet MSL, which I reported to ATC upon request.… ATC was monitoring and communicating throughout this event.… They asked why I had gone off my direct course to OOO, and I responded, "To get under the deck."… They updated me on OOO weather and obtained a PIREP [from me] indicating that the airport (whose name I do not recall now) in the vicinity was indicating better weather than OOO. OOO was reporting a 1,500 [foot] ceiling and I believe 5 or 7 miles visibility prior to my descent.

After about 10 minutes proceeding directly toward OOO, the ceiling lowered to about 1,500 [feet]. In the vicinity of [a wildlife refuge], it lowered further. At first I thought this was a brief "sag"in the clouds and would return to 1,500 [feet]. After about 15 to 20 seconds in IMC and no longer able to see the ground, I executed a climbing standard rate left turn in order to return to VFR on top.

I used my Garmin G5 to fly this segment in IMC. Just prior to this, ATC had warned of an obstruction at my 2 o'clock, which I noted on my ForeFlight display as well; hence the left turn. During the ascent, ATC asked if I was IFR rated and wanted an IFR clearance. I responded, "Negative."Once VFR on top, I completed a 360 [degree] turn and headed west toward [another airport], which ATC suggested as a VFR airport.… I notified ATC and terminated Flight Following with the airport in sight.

ASRS Report (Call Back)

Rote, Understanding, Application, or Correlation?

This B737 Captain described heavy icing conditions. Practical and philosophical questions were pondered regarding aircraft icing intensities and the accurate reporting of such to ATC. Lessons learned are implied between the lines.

■ On climb out, passing about 25,000 feet with a [temperature] of about -4, we picked up enough ice to almost completely obscure the forward window. I sent an ACARS Flight Ops report message to Dispatch for "heavy ice." Dispatch sent back a message that we needed to use the terms "moderate"or "severe,"as "heavy"was not a term used as a PIREP. Knowing that "severe"would have a major operational impact on our system, I wanted to make sure I was following the correct narrative, so I opened the Aeronautical

Information Manual (AIM) I had downloaded in ForeFlight. “Severe”icing was described as an accumulation rate that exceeded the ability of the aircraft’s systems. As we had placed the engine and wing anti-ice on, I had looked outside to see if we were getting the leading edge clear, and it appeared we were. To be honest, I’d never seen such icing buildup in [many] years of flying, and while I thought we could handle it, I was worried about other aircraft with deicing boots or military aircraft with no wing deicing. This left me with a question.

In reality, when would a 737 Next Generation (NG) ever experience the true definition of severe icing? If we did, could we tell? The side windows give very limited visibility to the wing, and if we had ice buildup aft of the leading edge, could we tell from the cockpit? I had my doubts. What about our ice accumulation on the vertical and horizontal stabs?

If our engine and wing icing could deal with this level of ice accumulation, would there be any level they couldn’t handle? I ended up reporting “moderate”icing, since that seemed to correspond to the AIM definition that we had. Still, for some reason, the experience left me a little worried that something in our guidance may be missing.

“ Cabin Crew Feed Back ”

From CHIRP(Confidential Human factors Incident Repor—ting Programme)

CHIRP Report (Feed Back)

Take–Off With Contamination On The Wings Prevented By Cabin Crew

〈Report Text〉

On reporting for duty, I learnt that our flight was delayed due to the late inbound aircraft. Following the briefing, I walked from the crew room with the rest of the crew to the terminal where we waited for our aircraft to arrive. During this time, it had also started to snow quite heavily. Following the arrival of our aircraft, all the crew went on board and I proceeded with my cabin checks and preparation for the flight whilst the other crew members did the same. At this point the Captain also did their walkround. Due to the delay, as soon as we had finished our checks, the passengers started to board the aircraft. After closing my door at the end of boarding, I noticed that there was a significant layer of snow accumulating on the wings.

At that stage I didn’t mention it to any of the other crew because I assumed that the pilots must be aware of it and that they must have requested de-icing, especially considering that three other aircraft due to depart at around the same time as us had requested this service.

However, during the announcement to the passengers, the Captain made no mention of having to deice the aircraft (which they normally do to inform the passengers what is going to happen in these circumstances) which I found strange but still I didn’t say anything because I was still sure that they were going to do it. I was also thinking that, as experienced pilots, they must know what they are doing and it wasn’t my place to tell them how to do their job. Shortly after this, we armed the doors for departure and took our positions for the safety demo.

During the safety demo, I heard the flight crew lock the flight deck door and start the engines and this was when it became clear to me that they had no intention of de-icing the aircraft. Towards the end of the safety demo, our aircraft had begun the short taxi to the runway and, by the time we had finished the demo, it was already at the holding point ready to enter the runway for take-off as soon as we passed the cabin secure to the flight crew.

Therefore, before beginning to secure the cabin, I told the SCCM that there was a significant layer of snow on the wings and that it would be a good idea to let the pilots know. They looked at the wings and agreed with me and called them. They initially replied to "stand by" then we entered the runway, turned around and exited it and parked in a holding area.

At this point an announcement was made to the passengers to explain what was happening and the FO came out from the flight deck, asked two passengers sat by the wings to get up from their seat while they shone a torch light over them. They then confirmed that it was ice, went back into the flight deck and the Captain then made an announcement to say that we would have to de-ice the aircraft.

So much snow was falling that even after de-icing the right wing, the snow was building up again whilst the opposite wing was being de-iced. The Captain then called me on the interphone to thank me for bringing it to his attention and said that they had only seen snow on the wing during their walkround but no ice and that was why they had not requested de-icing. My understanding was that there should be zero contamination on the wings during take-off be it snow or ice. In the end, we were delayed so much that the runway was closed due to the snow and our flight was cancelled.

Lessons Learned - In the future, I will report any contamination on the wings straight away without assuming that the pilots are going to request de-icing. I feel it is important that the pilots do not allow the delay to a service, or any other factors incite them to depart as quickly as possible when safety is compromised.

Following several aircraft accidents in the past, we know today that an aircraft should not attempt to take-off with any snow or ice on the wings so I feel it is extremely worrying that despite this, they were still going to attempt to take-off and also that nobody, except myself had noticed the severity of the situation which potentially could have ended in disaster.

• CHIRP Comment :

After discussing the event with the reporter, they confirmed that they had chosen to report the event to CHIRP rather than through the company reporting system as they felt that they may be penalised for reporting to the company.

There is however a responsibility (and Regulatory requirement) on all cabin crew members to report their individual safety concerns to the company wherever possible. By reporting this event to the company, it would have permitted them to investigate further and ask the operating flight crew their views on what had occurred. Being able to openly discuss events enables operators, pilots and crew to improve safety for the future.

However, it is encouraging to note that the reporter chose to raise their concerns with the flight crew at the time and which meant that the wings could be checked again by the flight crew and de-icing could be completed before departure. The flight crew reacted positively to the concerns raised by the cabin crew member and explained why they had not elected to have the aircraft de-iced after the walkround had been completed.

If any member of cabin crew has any concerns relating to potential ice or snow on the wings or if they are unsure as to if de-icing has been completed, they must raise these as soon as possible with both the SCCM and the operating Captain.

It must never be assumed that someone else has already spotted a potential safety issue – it is better to report something twice than not at all. Each operator will have a different procedure relating to contamination on the wings and other aircraft surfaces; this will be based on the requirement by the aircraft manufacturer and will be included in the FCOM (Flight Crew Operations Manual).

For example, the Airbus FCOM states that critical surfaces be checked; including leading edges, upper wing surfaces, vertical and horizontal stabilizers, all control surfaces, slats and flaps. A thin hoarfrost* is acceptable on the upper surface of the fuselage.

*Thin hoarfrost is typically a white crystalline deposit which usually develops uniformly on exposed surfaces on cold and cloudless nights. It is so thin that surface features (lines or markings) can be distinguished beneath it. If unsure of the company procedure, it should be queried with the flight crew as they can explain what is permitted and why. But remember that the most important thing in such incidents is to report your concerns as soon as possible.

“ General Aviation Feed Back ”

From CHIRP(Confidential Human factors Incident Repor—ting Programme)

CHIRP Report (Feed Back)

WayWard Technology Distracts From The Basics

〈Report Text〉

This is a simple story about how I came within seconds of infringing airspace because of a most elementary error. I hope other pilots may learn from it. I learnt to fly in the days when VFR navigation was all about, and only about, roads, railway lines, rivers and other features, your chart and watch.

This was not only before electronic charts, but before GPS/GNSS. Later I bought a very basic hand-held GPS unit, in which waypoints had to be laboriously input using lat and long. But this nonetheless made accurate navigation so much easier. Then, some years ago, I switched to using SkyDemon on an iPad. I am an enormous fan of SkyDemon. Like any combined electronic chart and GPS/GNSS, whether portable or permanently installed, it reduces hugely the workload of flying.

Not only does it give position, track and time to next waypoint information, but if connected to a cell phone network you can get NOTAM and weather information in real time. I even use it to file Flight Plans. There is an electronic PLOG feature in SkyDemon, which is very attractive-looking and has the benefit of keeping itself up to date with timings and using real-time wind forecasts if available.

But I don’t use it. I still draw lines on paper charts, write magnetic headings on them, and print out a paper PLOG which I manually keep up to date on my kneeboard during flight. Why? One reason is that I think it increases pre-flight situational awareness, but the main reason is because technology can fail. Even a certified, installed device from the likes of Garmin, can fail in flight, but a consumer product like an iPad is all the more vulnerable. So, I have always figured that having an instantly available map and paper PLOG to revert to in the case

of in-flight failure of the technology is a good thing. Yesterday it happened to me. I was happily flying along, taking a friend as a first-time light-aircraft passenger for a pleasure flight in good weather. I was flying parallel to, and a few miles north of the boundary of the controlled airspace of a major airport. Then my SkyDemon suddenly said it had lost location data. I was highly distracted by this annoyance. I tried putting it on the coaming over the instrument panel to get a better view of the sky, but in many hours of flying, it had never done this before. I fiddled about with it. My required heading could not have been simpler: 090 degrees. There it was written on my PLOG. But I was highly distracted by this SkyDemon/iPad glitch. And a chatty passenger.

My heading drifted right to 100°, then 105°, converging towards the controlled airspace. Suddenly SkyDemon regained lock and told me "controlled airspace in 0.5NM"! I veered left to 075° and avoided infringement by the skin of my teeth.

I was and am right to have manual back-up at instant readiness, but I didn't use it. What I should have done was put the wayward iPad to one side and used my DI, of course kept aligned to the magnetic compass, to steer 090°, or better still, a bit north of that, to get well clear of the controlled airspace before looking to remedy the situation with the technology. When I later reviewed my actual track from my ADS-B Out on flightradar24.com I went white when I saw just how close I became to infringement.

The lesson – love and use electronic navigation technology, but don't get distracted from the basics of flying and navigating if it throws a wobbly – get yourself space and time before trying to sort it out.

• CHIRP Comment :

This excellent report provides a very good example of a common problem: managing a technical failure – sometimes referred to as threat and error management. Normal human behaviour is pragmatic and difficult problems are routinely abandoned as 'too difficult'. However, pilots are susceptible to persevering with interesting technical problems beyond the point of prudence. The reporter is correct to identify, with hindsight, that he should have reverted to his paper chart immediately his SkyDemon/iPad began to malfunction and a turn of a few degrees away from CAS might also have been prudent.

Aviation Communication

Confusing ATC radio communication terminology

The aviation industry is currently enjoying unprecedented success thanks to stunning technological developments (such as improved engine efficiency and reliability, automation, navigation systems, etc.). But despite such advanced technologies, radio communication between the controller and the pilot has almost not changed at all, and still mainly depends on voice communication. This could be because language is a high-level thinking ability that only human beings can exercise.

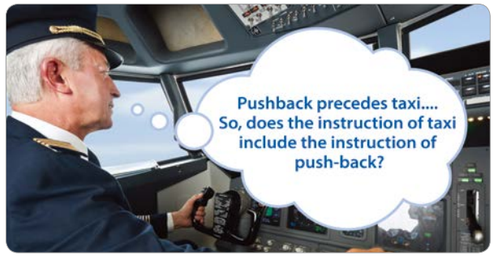
But language-using human beings are not perfect, and even the language we use is not perfect, and has intrinsic limitations. In radio communication, which always requires the best accuracy, the intrinsic limitations of language and the intervention of inappropriate judgment by human beings have resulted in factors that can cause message distortion and misinterpretation, and such factors have not yet been resolved.

Errors in communication due to language-specific structures and differences in the ways of expression and the problems of pronunciation and words are frequently pointed out as the fundamental source of major hazards in aviation safety management, but it's not possible to identify clear solutions to these problems. Moreover, with the increase in aviation traffic volume, the amount of language-mediated radio communication between the controller and the pilot has been rapidly increasing, so the importance of such radio communication is also growing.

Even if new solutions using satellite-based next generation data communication technologies are anticipated, ATC radio communication still requires that attention be paid to how words are used in order to secure safety in the current communication environment until there are next-generation technologies to ensure consistency and safety. Today, one of the biggest problems intrinsic to ATC radio communication is the use of unstandardized ATC terminology. Given that only the use of standardized ATC terminology can streamline over 80% of radio communication, it can be said that compliance with standard terminology is the best and ultimate measure to prevent errors in radio communication. Many incidents referred to as confusing radio communication originated from the use of terminology that causes temporary confusion and chaos between the pilot and the controller. In this issue, one example of this will be covered.

Unstandardized ATC terminology can be used in every flight stage. An example of using the term "Push back/Taxi," which has been proposed as an alternative phrase to prevent incidents, will be introduced below as an example of unstandardized terminology generally used in each flight stage (which may or may not cause serious consequences).

• Pushback/Taxi :



After the pilot receives IFR clearance, the next communication with ATC is generally a push-back request. In this process, attention should be paid to the fact that even if someone uses a term from which it can be interpreted that everyone is cleared, clearance does not apply to others. In particular, if the controller does not think that he has granted clearance for what the pilot thinks is cleared, the potential hazard could be very serious, and such conflicting awareness of the situation would result in the worst consequences, that neither of them would expect.

• Example

Classification	ATC terminology	Interpretation
Ground Control →HL123	"HL123, Ground, report ready for taxi, use caution company traffic pushing back from gate 101"	"HL123, it's ground control. Report to me when you are ready for taxi. Watch out for the aircraft belonging to your company that is pushed back from the gate 101."

The ground operator, having received the above instruction, turned HL123 around to push it back, which made HL123 block the inner taxiway. At this time, the ground controller who saw it called HL123 to point out that HL123 pushed back without clearance.

However, the pilot reported that he thought he was cleared for push back because the controller had told him "Advise ready for Taxi." In addition, the pilot offered the opinion that the controller shouldn't have mentioned taxi, or should have told him that he was not cleared for taxi if he had not wanted HL123 to push back.

In many large-scale airports, some gates are controlled either by ATC or by the air carrier, with the controller securing the view. In this scenario, the start of flight will be controlled as agreed and promised between the air carrier and the air control. Of course, even in this case, it sometimes may not be clear who has jurisdiction over the gate area. If the gate is controlled by the air traffic control unit, the controller should grant clearance using clear and concise standard terminology such as "Hold" or "Push back approved." If the gate is operated under the air carrier's responsibility, pilots should be more careful not to enter the taxi way during the push-back operation.

As such, the message from this problem is obvious and clear. The controller should present clear limits for clearance, whether he or she is giving instructions to the pilot or to the ground operator. In other words, the controller should provide an accurate message in order to prevent the pilot from being confused in terms of what he or she should do and what he or she shouldn't do. On the other hand, if the pilot thinks that there is any chance there has been a misunderstanding, he or she is required to communicate with the controller, using such terms as "Confirm" or "Say again," to enhance understanding and prevent confusion.

Communication errors related to the performance of instructions and clearance frequently occur in every flight stage. The reason why the ground control instruction of "Taxi to Runway XX via A, B, C" has been replaced with "Taxi to Holding Position Runway XX" is because incidents have been reported that are mainly attributable to pilots misinterpreting that clearance for the runway includes "line up on the runway". After such incidents were reported, controllers started to strategically add "Hold short of Runway XX" to the instruction "Taxi to Runway XX via A, B, C" to avoid misinterpretation as much as possible, and then ultimately replaced the terminology.

This also applies in the air. When the controller tells pilots "Contact approach 128.3, Report speed 230 knots," they are confused about whether the instruction means "report the current speed and then change the frequency" or "change the communication frequency and then report the current speed".

When they are told "Descend to 7,000 feet, Reduce speed to 180 knots" they are confused regarding whether it means "descend and reduce the speed simultaneously" or "descend first and reduce the speed later." In such case, even if the ATC environment is congested with traffic, the controller should give instructions in clearer way, such as "Descend to 7,000 feet and reduce speed to 180 knots" or "Descend to 7,000 feet and then reduce speed to 180 knots" to specify whether these two operations are to be conducted at the same time or separately. Exact communication using simple terminology would be the simplest way to reduce workload.

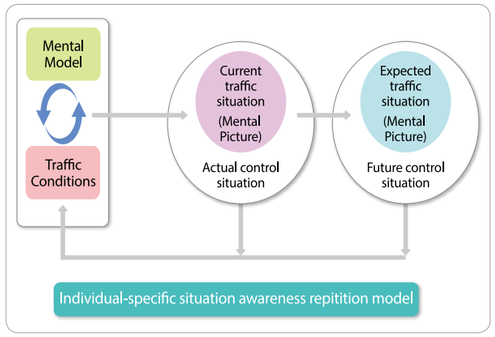
As this factor affects the performance of the aircraft, the controller must clarify his or her instructions. But this is not just a matter of clarity of the controller's instructions. Rather, the pilot should be able to clarify what such confused instruction or clearance is intended to mean, and should avoid flight operation based on guesses and estimates of what such instructions or clearance would mean. Just as with checking the checklist before flight, even during flight, the pilot should keep in mind that anything that is unclear in the ATC communication with the controller should be checked and verified immediately.

As stated above, making pilots and controllers use simple, standardized and concise ATC terminology both to eliminate the possibility of unclear radio communication and to enable them to correct and clarify confusing communication is the basic goal of the International Civil Aviation Organization (ICAO) and the background of standardized ATC radio communication terminology.

Expert Contribution

Mental model and aviation safety culture

One of the most important missions of air traffic controllers is to effectively maintain the situation awareness (SA) that is required to continuously monitor and identify the air traffic control (ATC) situation. This is because the mental model (e.g. overall job knowledge or experience) required for the task or act needs to be adjusted according to the mental picture that is one's personal way of handling situation-specific tasks, which is the reaction condition based on actual traffic conditions, control environment and limitations on actual traffic flow. The air traffic controller should be aware, understand, predict and control the future traffic events based on his or her own mental picture, and constantly compare the expected traffic situation with the actual traffic situation.



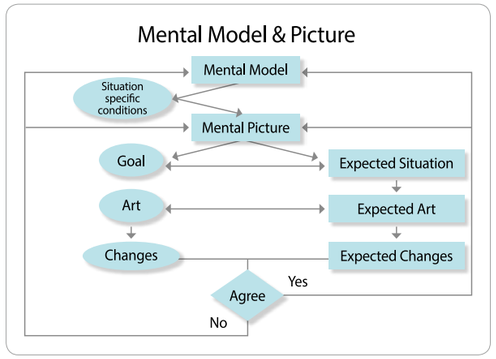
To understand how the world works, people generally simplify what is happening in the world by creating images, assumptions or stories in their mind. They store events in their mind in a simplified form through their own recognition process.

A mental model can be simply generalized – like the statement "Human beings are not reliable" – or established in a complex theory. The only difference is that even if a similar mental model has already been established, differences become distinct and superiority and inferiority are distinguished in the individually established mental picture stage. This part is the mental model that recognizes the positive results achieved from the experience of individual-specific job ability as the outcome.

In simple terms, the mental model can be thought of as a view of life achieved from a wide range of experiences that a person has throughout his or her life. A mental picture is like a short clip(meme) of the way of life to feel joy, sorrow or happiness.

An air traffic controller's decision-making and job performance are determined through various display, information reading and communication channels. In modern times, the basis of the air traffic controller's situation awareness is formed under the more advanced ATC environment. Therefore, the quality of the air traffic controller's mental model mainly depends on his or her ability, training and experiences, preconception, goals and current workload. Even the best trained or most experienced controllers can make a bad decision under pressure if they have incomplete or incorrect situation awareness.

At the same time, inexperienced controllers may not be able to take appropriate action even if they perfectly understand what's going on.



[Flow of mental model and mental picture]

An individual controller becomes involved in the decision making process through the feedback stages shown above. In addition, different actions can be taken depending on the controller's ability, and the controller obtains individual feedback on the results of action taken as an experience. Through this, a constantly repeated model is created.

Air traffic controllers tend to think that they are at their maximum ability based on their job experiences. In other words, it is probable that their expertise makes them likely to overestimate their own job abilities. Although general theoretical job knowledge for air traffic control can be standardized, the individually applied mental picture for job performance may vary significantly depending on the function and methodology.

In addition, if a negatively acquired situation awareness model, such as being aware of incorrect individual information or sticking to the job procedures of the senior controller, is used at a moment of crisis, the consequences are unpredictable.

Efforts should be made to establish an individual-specific mental model on this basis. But the emergence of an advanced air traffic control system would lead to a passive cognitive attitude that is not appropriate for the establishment of an individual-specific mental model. To resolve this drawback, knowledge training should be conducted not only to enhance the ability to handle the existing air traffic control operations using a system that can maximize the ability to use information provided from the advanced air traffic control system, but also to enable the simultaneous use of such an advanced system. While previous training was focused on the accumulation and establishment of a mental model, new training should be integrated system-based mental model training that can enhance the controller's ability to analyze and use information from the system and increase his or her expertise in handling existing operations.

This means that a mental model should be established that can recognize analysis information provided from the system, identify errors and the appropriateness of such information and effectively handle the situation, rather than simply handling situation-specific tasks.

Aviation safety culture should be addressed in all aviation sectors. But this article intends to emphasize that a basic mental model for the safety management of air traffic controllers and a positive mental picture should be established.

It is also desirable that sustainable and inimitable personal expertise be developed, and mature and positive job experiences shared to ensure an aviation safety culture that is not disturbed by internal and external environmental changes. I hope that such measures can accelerate the development of a predictable and autonomous safety culture.

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