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NEXT FLIGHT MAGAZINE **INTERNATIONAL**

U.S. Focus • Global Perspective

U.S. OPERATIONS

Flight Safety • Human Performance
Professional Judgment

NOTAMs | Weather

Airport Surface Safety | TCAS / ACAS

Human Performance | Crew Cross-Checks

FREE PUBLICATION FOR COMMERCIAL AND AIRLINE PILOTS

nextflightpilots.com

INTERNATIONAL EDITION | ISSUE 01

U.S. Focus · Global Perspective

Inside this issue

An English-language selection for professional pilots, centered on U.S. operations and the shared safety challenges of international aviation.

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Publication and source context

Compiled on October 3, 2026 from six existing public NFA English articles. Technical wording, examples and source references are preserved. References retain their original context; this compilation is not a new technical or regulatory review. This issue is separate from the Portuguese Brazil Edition.

Independent educational publication. No FAA, regulator, manufacturer or operator endorsement is implied. It does not provide certification, regulatory credit or approved operational procedures.

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EDITORIAL INTRODUCTION

From information to judgment

Welcome to Next Flight Magazine International. This first English issue places U.S. operations at the center of its reading selection while retaining a wider professional perspective. It is designed for commercial and airline pilots, instructors and aviation safety professionals who want to connect technical study with the questions raised by everyday operations.

The opening article, Fly What You Can Verify, introduces the thread running through this issue: the relationship between a plan, observable indications and crew judgment. It provides a starting point for reading the three U.S. operational features that follow.

U.S. NOTAMs and Temporary Operational Changes examines how published changes relate to the planned flight. Weather Intelligence in the United States considers the questions answered by different weather products and the limitations that accompany them. Airport Surface Safety in the United States turns attention to clearance understanding, physical position and shared crew awareness on the airport surface.

The final two features broaden the perspective. When TCAS Commands addresses traffic advisories, resolution advisories and the boundary between educational discussion and approved operating procedures. Fatigue of Pilots explores the human-performance dimension and the reference framework already included in the original NFA article.

These are complete public articles, assembled for a continuous reading experience rather than rewritten as a new procedural manual. The contents page and PDF bookmarks let you move directly to a feature; its retained reference links provide a route back to the source framework. The online English article remains available alongside this issue.

NFA is an independent educational platform. This publication does not claim regulatory approval, recurrent-training credit or technical revalidation. The current documents and procedures applicable to the aircraft, operator and operation remain authoritative. The Brazil Edition continues separately in Portuguese; International adds an English publication with a primary focus on American readers.

FEATURE 01 | FLIGHT SAFETY



NFA editorial illustration | Visual context, not procedural guidance

Fly What You Can Verify

Evidence-Based Flight Safety in the Cockpit - how crews use actual indications, independent checks and changing trends to protect the flight path.

[Read the public English edition online](#)

An aircraft can be correctly programmed, a checklist can be complete and both pilots can agree on the plan - yet the aircraft can still be moving toward an unsafe state. A plan describes what should happen. Flight-deck evidence shows what is happening. Safe crews continually compare the two and act when the difference matters.

PREDICT → OBSERVE → COMPARE → ACT → RECHECK

This is the operational meaning of evidence-based flight safety. It is the discipline of using observed aircraft behavior, reliable indications and independent crew cross-checks to decide whether the current plan remains safe. It connects with Evidence-Based Training (EBT), which develops and assesses observable crew competencies using operational evidence; in flight, the same attention to observable behavior helps pilots turn an uncertain situation into a defensible action.

SCOPE

The examples are conceptual and aircraft-neutral. They do not establish new callouts, speed gates, stabilization criteria or emergency procedures. Approved aircraft documents, regulations and operator SOPs govern the actual operation.

01

Evidence is what the crew can observe and test

A reassuring statement is not evidence merely because it sounds confident. “The aircraft is configured” is a conclusion; the actual configuration indications, checklist status, flight-path response and any relevant warnings are the evidence used to support it. Likewise, “the automation has it” is an assumption until the crew confirms the active modes, selected targets and resulting trajectory.

Useful evidence has three qualities: it comes from a source suitable for the question, it is current enough for the phase of flight and it can be checked against another indication or expected result. A single display can be accurate while the underlying data entered into it is wrong. Two displays driven by the same erroneous source may agree without providing an independent check.

The crew should distinguish an observation from an interpretation: “vertical speed is increasing” describes a trend; “the autopilot is malfunctioning” assigns a cause. Keeping that distinction visible prevents an early theory from directing attention away from competing explanations.

WORKING QUESTION

What do we know from the aircraft now, what do we merely expect, and what would disprove our expectation?

02

Start each phase with a predicted aircraft state

Monitoring is most effective when pilots know what should be seen next. Before a level-off, the crew expects an appropriate change in vertical guidance and a reduction in vertical speed. After a thrust selection, it expects the commanded thrust and the aircraft's acceleration to agree with the intended operation. On final approach, it expects a converging lateral path, a controlled vertical path, suitable energy and the required configuration.

This prediction gives meaning to indications. A deviation is identified earlier when the crew knows both the target and the expected trend. Monitoring only after an alert or a large excursion leaves less time to recover.

PREDICT → OBSERVE → COMPARE →
ACT → RECHECK

“Recheck” completes the loop. A crew may select a new mode or speed and still fail to obtain the intended result. The corrective action becomes evidence-based only when its effect on the actual aircraft state is verified.

03

A briefing should produce testable expectations

A strong departure or approach briefing identifies the highest-consequence threats and the indications that will reveal whether they are being managed. It describes the intended runway and entry, flight path, automation use, terrain or weather constraints, likely workload peaks and the conditions that require a change of plan.

For example, “the runway is short and wet” becomes operational when the crew confirms the actual runway and intersection, the current runway condition, the performance basis, the intended landing point and the approved decision criteria. “There may be a tailwind” becomes useful when the crew agrees which current wind reports and aircraft indications will be checked, and what consequence a change would have for landing performance.

The briefing should also invite the other pilot to challenge a mismatch. A shared plan can create shared expectation bias; explicit cross-check roles help prevent both pilots from accepting the same incorrect assumption.

BRIEFING STANDARD

Name the threat, the observable cue and the decision that follows if the cue appears.

04

Takeoff: verify the real runway and aircraft

Takeoff performance depends on the conditions actually present, not just those stored in a calculation. Runway entry, available distance, aircraft mass, configuration, thrust setting, environmental inputs and limitations must match the approved performance data. The runway sign and chart, the cleared route, the performance calculation and the aircraft setup are separate parts of one safety case.

An intersection departure illustrates the value of independent evidence. A crew may have correctly calculated full-length performance but then accept an intersection clearance. The runway in front of the aircraft is shorter than the runway in the calculation. A deliberate comparison of clearance, physical entry point and performance basis exposes the mismatch before thrust is applied.

During the roll, the pilots monitor the actual response through the indications and callouts specified by their SOP. Acceleration, thrust, airspeed agreement, configuration messages and runway cues can reveal that the aircraft is not behaving as expected. These observations must feed the operator's approved rejected-takeoff decision logic; they do not justify inventing a new speed threshold during the roll.

TAKEOFF EVIDENCE

Calculated performance is a prediction. Runway position, aircraft setup and achieved response must support it.

05

Automation: test the mode against the path

A selected value is an intention. An active Flight Mode Annunciator (FMA) mode shows what guidance is engaged. The aircraft's actual path shows the result. These are three different pieces of information, and none should silently substitute for another.

After a mode change, the crew should apply the operator's callout and cross-check standard, then observe whether the aircraft responds in the expected direction. If an altitude capture is expected but vertical speed remains high, the discrepancy deserves attention while there is still margin. If a lateral path diverges after a route modification, re-reading the flight management entry alone is insufficient: the trajectory must be confirmed.

Automation can reduce workload, but only while its behavior remains understandable and suited to the task. When the current mode, target or path cannot be verified promptly, pilots use the approved level of automation and flight-path control that restores a clear, manageable aircraft state.

THREE-PART CHECK

Selected target → active mode → observed flight path. A mismatch between any two calls for reassessment.

06

Anomalies: separate fact from explanation

During an abnormal event, the first cue may be incomplete or ambiguous. An airspeed disagreement, navigation shift, unexpected alert or cabin-altitude trend does not immediately reveal its cause. The crew gains time by protecting the flight path, identifying what each source actually reports and using the applicable approved procedure.

Consider a sudden speed split. The evidence may include differing airspeed indications, pitch and thrust, ground speed, aircraft attitude, flight-path trend and alert status. Some of these sources may share dependencies or be affected by the same conditions; none should be promoted to "truth" solely because it appears plausible. The crew must follow the aircraft-specific unreliable-airspeed procedure and use the references it authorizes.

Say what is observed before saying why it happened. "Left and right indicated speeds disagree; pitch and thrust are stable" gives both pilots a common starting point. "It is a blocked probe" may be a hypothesis, but it must not shortcut the approved diagnosis or draw attention away from maintaining control.

07

Approach: recognize a shrinking safety margin

An approach can appear orderly while several margins deteriorate together: speed drifts high, the descent rate increases, configuration is late, the touchdown point moves down the runway or the wind changes. Each deviation may look recoverable on its own. Their combination may make a safe landing unlikely.

The crew should compare actual flight path, energy, configuration, runway condition and landing-performance assumptions with the operator's stabilization and go-around criteria. The purpose is to decide in time, while a normal escape path is still available. A late correction that temporarily centers an indication does not necessarily restore the full safety margin.

If the approach does not meet the applicable criteria, the approved response applies. A go-around is a planned operational option, not a judgment on a pilot's ability. A timely decision uses present evidence rather than hope that the next few seconds will repair the state.

APPROACH QUESTION

Is the aircraft in the required state now, and is the trend carrying it toward a safe landing within the approved criteria?

08

PF and PM build independent checks

The Pilot Flying (PF) manages the flight path; the Pilot Monitoring (PM) monitors the aircraft state and system status, calls deviations and supports the operation under the operator's SOP. Both pilots need a shared understanding of the intended path, but they should preserve independent attention to the aircraft's actual behavior.

An effective monitoring call states the discrepancy clearly: "High on path," "Speed increasing," or the operator's prescribed callout. The next exchange confirms a corrective action and its effect. Long causal debates while the flight path is deteriorating can delay intervention. If the deviation persists, the crew applies the escalation and control-transfer rules in its SOP.

Monitoring is active work. It includes checking the clearance against the intended route,

verifying an FMA change, watching the trend after a correction and speaking up when the evidence conflicts with the plan - even when the other pilot is senior or both pilots were previously confident.

09

Set decision thresholds before workload rises

Crews make better decisions when the conditions for continuation, modification or abandonment are identified before the critical moment. Examples include the approved stabilization gate, runway and performance constraints, fuel decision points, weather limits and the trigger to stop taxi when position is uncertain.

These thresholds come from regulations, aircraft performance, operator procedures and the actual situation. This article does not supply numbers. Its operational lesson is to make the relevant threshold visible in the briefing, monitor the evidence against it and execute the associated action when it is reached.

A threshold loses its protective value if the crew continually moves it to accommodate a worsening picture. When new information invalidates an assumption, the crew should update the plan explicitly rather than silently accepting more risk.

10

Worked scenario: an approach that stops matching the plan

Briefed plan. The crew has reviewed an instrument approach to a wet runway. The current landing calculation and the operator's stabilized-approach criteria support the intended landing. The crew agrees to monitor wind, flight-path capture, energy and the intended touchdown area.

New evidence. After a late vector, the aircraft is above the planned vertical path. Speed remains high while configuration is delayed. A fresh wind report differs from the briefing, and the runway remains wet. None of these facts alone explains the entire situation; together they reduce the available margin.

Cross-check and decision. PF and PM confirm the active mode and actual path, the latest wind and performance implication, then compare the current aircraft state with their approved stabilization criteria. If the criteria are not met at the required point - or the crew cannot establish an acceptable state - the go-around follows the operator's procedure. The crew then rebriefs with updated weather and performance information before another approach.

The key learning is the sequence. The crew does not wait for a runway warning or a dramatic deviation. It uses modest, accumulating indications to make a decision while options remain.

11

Debrief observable crew behavior

EBT is based on evidence about real operational threats and on observable crew competencies. Its most useful cockpit question is not "Did the crew finish the event?" but "What did the pilots notice, say and do as the situation changed?" An instructor might examine whether the pilots anticipated the threat, detected a mismatch, communicated it, managed workload, used the appropriate procedure and confirmed that their action worked.

For the approach scenario, a useful debrief identifies the actual cue, who noticed it, the callout, the agreed decision point and the aircraft state after the decision. "Good situational awareness" is too broad to guide

improvement. "PM identified the high-energy trend, stated the deviation, and both pilots compared the state with the stabilized-approach gate" is observable and discussable.

The same discipline helps a crew learn from ordinary line operations. An unexpected mode, a corrected runway-entry mismatch or a timely go-around can reveal a successful defense worth preserving. Evidence supports learning when it describes behavior precisely and avoids guessing at motive.

12

Professional takeaways

1. **Brief a prediction.** Know the state and trend that should appear next.
2. **Observe actual behavior.** Distinguish selected targets and written calculations from what the aircraft and environment are showing.
3. **Cross-check the source.** Agreement between dependent indications may not be independent confirmation.
4. **Call the discrepancy.** State the observed mismatch clearly before committing to a cause.
5. **Act at the approved threshold.** Preserve margin by using established SOP and aircraft-specific criteria.
6. **Verify the effect.** A mode selection or corrective input is incomplete until the aircraft responds as intended.
7. **Debrief behavior.** Record the cue, crew response and resulting aircraft state to strengthen future performance.

EXPECT → OBSERVE → CHALLENGE →
DECIDE → VERIFY

Official references and further study

1. ICAO. Doc 9995-1 - Manual of Evidence-Based Training, Volume I: Aeroplane Pilots.
2. EASA. Easy Access Rules for Air Operations - ORO.FC.231 and associated AMC/GM on EBT and observable behaviors.
3. FAA. AC 120-71B - Standard Operating Procedures and Pilot Monitoring Duties for Flight Deck Crewmembers.
4. FAA. AC 120-123 - Flightpath Management.

EDUCATIONAL USE

This NFA study supports professional learning. It does not replace current regulations, approved AFM, FCOM, FCTM, QRH, MEL/CDL, operator SOPs, performance data or training. The applicable authority, aircraft and operator guidance always prevail.

Reference links retained from the article

Doc 9995-1 - Manual of Evidence-Based Training, Volume I: Aeroplane Pilots.

<https://store.icao.int/en/manual-of-evidence-based-training-volume-i-aeroplane-pilots-doc-9995-1>

Easy Access Rules for Air Operations - ORO.FC.231 and associated AMC/GM on EBT and observable behaviors.

<https://www.easa.europa.eu/en/document-library/easy-access-rules/easy-access-rules-air-operations>

AC 120-71B - Standard Operating Procedures and Pilot Monitoring Duties for Flight Deck Crewmembers.

https://www.faa.gov/documentlibrary/media/advisory_circular/ac_120-71b.pdf

AC 120-123 - Flightpath Management.

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_120-123.pdf

FEATURE 02 | U.S. OPERATIONS



NFA editorial illustration | Visual context, not procedural guidance

U.S. NOTAMs and Temporary Operational Changes

Interpreting notices for route, procedures, airports and alternates.

[Read the public English edition online](#)

01

Start with the flight, not the length of the list

Long NOTAM lists invite two opposite errors: scanning so quickly that a critical amendment is missed, or reading every line with equal attention until the operational picture disappears. Begin with the proposed runway, taxi route, SID, route, arrival, approach, destination, and alternates. Review the whole applicable briefing, then mark the items that alter one of those elements.

A useful sequence is to begin with the intended operation and then search for changes to each part of it. At departure, that means the stand and surface route, runway, departure procedure, required navigation, and first part of the route. At destination, it means the arrival, approach, runway, landing aids, and movement to parking. The alternate deserves its own pass. This sequence makes a notice relevant because it touches a specific choice, rather than because it appears high in a vendor's list.

Place each affected item on a timeline. A runway closure that begins after the scheduled departure may still matter if a delay moves the flight into its validity period. A procedure amendment that expires before arrival may still matter if the flight arrives early. Check issue time, effective start, end, and any daily schedule, using UTC unless the source explicitly states otherwise.

Build a short change statement: "The planned landing runway remains available; the preferred ILS has an amendment effective before ETA; the alternate has a taxiway closure affecting gate access." This turns notices into questions the crew can resolve in the release, chart, performance, and briefing workflow.

Time should include a realistic window around the estimate, not only a single ETA. A delayed pushback may bring a runway closure into force; holding may extend an arrival beyond the end of a service period. For a notice with a daily schedule, identify the days and hours that actually apply and keep all comparisons in the same time basis. If the notice contains an exception or uncertain end time, read the complete text and use the approved source to resolve it.

02

Understand the U.S. information structure

The FAA AIM distinguishes domestic NOTAMs, FDC NOTAMs, international NOTAMs, and military NOTAMs. Domestic notices often concern airport conditions, surfaces, aids, communications, and services. FDC notices can amend an instrument approach or published chart and can communicate regulatory information, including temporary flight restrictions. International notices use the ICAO format. A label indicates distribution and subject; it does not determine whether the item matters to the flight.

A NOTAM search limited to the airport identifier can miss a route constraint. The FAA AIM specifically calls for attention to ARTCC notices, which may concern temporary flight restrictions, GPS operations, special use airspace, or route changes. The crew should match the applicable center areas and planned route to the briefing provided by the operator. The purpose is to catch a notice whose location field is broader than a single airport.

Keywords provide a useful first pass: RWY, TWY, APRON, AD, NAV, COM, AIRSPACE, SID, STAR, IAP, and CHART name different affected domains. Do not discard an item because its keyword looks unrelated. A GPS testing notice can affect a planned RNAV operation; an

airport service notice can affect a diversion; an IAP amendment can change the procedure on a chart that still appears current in the EFB.

Use the FAA Federal NOTAM System or an operator-approved briefing service to verify the current text. A map pin, color, or EFB summary is only an index to a notice. Read the original wording and its associated location and time before making an operational decision.

Notice categories and keywords help sort the briefing; they do not establish operational priority. A runway closure can change takeoff performance, an unserviceable lighting system can change an approach's usability, and an FDC amendment can alter published procedure information. The operational question is what the notice changes for this aircraft and this flight. Where abbreviations are unclear, use the official contractions reference instead of guessing from familiar-looking letters.

03

Decode a notice into an operational change

Extract five fields: affected location or facility; exact asset or procedure; nature of the change; effective period and schedule; and the action required in the flight plan or briefing. For example, "RWY 18/36 CLSD" means more than a closed strip. It can change departure performance, expected taxi, arrival runway, crosswind exposure, approach choice, and alternate viability.

Read the text as a bounded instruction about an identified object. A NOTAM for one runway threshold, one taxiway segment, or one IAP variant does not automatically apply to every similar item at the airport. Confirm the identifier, direction, facility, and period before transferring the meaning to the chart. The crew should distinguish a full closure from a

partial limitation, such as a changed declared distance or unavailable component, because the resulting performance or approach calculation can differ materially.

For a NOTAM affecting an instrument procedure, compare the notice with the current chart and the aircraft or operator authorization. Identify whether the amendment changes a minimum, missed approach, fix, navigation requirement, or procedure availability. If the procedure data in the FMS, chart, notice, and ATC clearance do not reconcile, stop the setup and resolve the difference using approved sources.

For a navigation aid outage or GPS interference notice, ask which segments depend on the affected source and what approved alternate navigation remains. Do not assume a navigation display that appears normal proves the underlying service is available for the intended operation.

Translate the notice into the systems and decisions it touches. A displaced threshold may require review of the usable landing distance and visual references; an unavailable approach light may affect authorized minima; a NAVAID outage may remove an intended segment or require an approved alternative. These are questions for the current chart, approved aircraft documentation, and operator procedures. The NOTAM text identifies the change; it does not by itself complete the crew's calculation or authorization check.

04

Review airport and surface notices as a route

Compare runway, taxiway, apron, lighting, construction, and work-in-progress notices with the airport diagram. Trace the movement from stand to runway or from landing runway to parking. A taxiway closure may create an unfamiliar crossing or a longer taxi with a new performance, fuel, or timing consequence.

A surface restriction can create a second-order risk even when the intended runway remains open. The remaining route may pass a hot spot, a runway holding position, a narrow taxiway, or a construction boundary. The crew should trace an actual path on the diagram and identify where a new clearance is needed. If ATC offers a route that appears inconsistent with a closure or the aircraft's limitations, stop and clarify before proceeding.

At a destination, check whether the expected landing runway, runway exit, and access to the planned stand remain feasible. At an alternate, check the approach, runway, services, and surface route. "Airport open" is not enough to establish that the alternate is suitable under the operator's dispatch rules.

After ATIS or a clearance changes the expected runway, revise the NOTAM scan around the new choice. An item originally irrelevant to runway 27 may become central to runway 09. Make that reassessment explicit in the arrival briefing rather than assuming the preflight filter still applies.

After landing, the runway exit that was expected during descent may no longer be usable. The crew should have enough awareness to avoid an improvised turn, while treating the actual taxi clearance as controlling the route. If the exit differs from the briefing, reestablish position, confirm the new path and any runway boundaries, and

postpone nonessential cockpit work until movement is understood. Surface NOTAMs and the companion NFA airport-surface study should be read together.

05

Treat airspace and GNSS information as route constraints

FDC NOTAMs may announce a temporary flight restriction. Check the exact lateral and vertical limits, effective window, conditions, and published source. A graphical portrayal helps orient the crew but does not replace the notice. Determine whether the cleared route and likely vectors intersect the affected area and coordinate through dispatch or ATC as appropriate.

A TFR must be interpreted from its current notice, including lateral limits, vertical limits, validity, exceptions, and any contact or authorization conditions. A map overlay can help locate the area but may conceal a boundary detail or an amended effective time. A reroute should be checked against fuel, terrain, weather, airspace, and ATC clearance, rather than treated as a simple line around a graphic.

The FAA AIM describes GPS status, testing, and anomaly notices. A published testing area signals possible degraded or unavailable service; its effect depends on actual timing, aircraft capability, and intended route or procedure. Cross-check the flight's navigation plan and alternatives. If the aircraft encounters an anomaly, use the operator's procedures and promptly tell ATC.

Large-scale restrictions and navigation changes can propagate beyond the named airport. A departure route amendment can alter a downstream clearance; a GNSS interruption can remove an intended approach at the destination. Think through the next

decision, not only the first affected waypoint.

GNSS testing and interference notices require careful distinction between an area of possible effect and actual navigation performance. Consider the planned use of GNSS for en route segments, RNAV arrivals, approaches, and aircraft functions that depend on position data. Monitor the aircraft's annunciations and integrity indications under approved guidance. Do not infer that an apparently normal map display confirms the integrity or availability required by an approach.

06

Recheck at operational decision points

An effective NOTAM picture is maintained, not simply collected before departure. Recheck changes when the release is updated, departure is delayed, the runway or route changes, the alternate changes, and before setting up an affected arrival or approach. In flight, use approved company and ATC channels for updates within the available communications and workload.

Define who owns the update at each decision point. Before departure, the crew can reconcile the dispatch release, current NOTAM briefing, ATIS and charts, and record a meaningful change. In flight, the PM can review a new airport or procedure notice while the PF preserves flight-path control and ATC awareness. The result should be a short shared conclusion: what changed, whether the current plan remains valid, and when it will be checked again.

Distinguish a new notice from an old notice that only became relevant after a clearance change. Either can require the same response: revisit charts, performance, briefing, and operational control. If critical source data are missing or contradictory, obtain clarification before crossing the relevant decision point.

Do not treat an EFB “download successful” indicator as proof that the notice set was refreshed at the required time. Confirm the update timestamp and applicability, and use the operator’s accepted method for offline or connectivity-limited operations.

A recheck should be proportionate to the change. A gate delay calls for a new time comparison; a runway swap calls for a runway, approach, performance and surface scan; a diversion calls for a full review of the new airport and alternate chain. If data connectivity is limited, follow the operator's contingency process and communicate uncertainty rather than treating an old briefing as current.

07

Worked example: amended arrival and changing runway

A crew initially expects an ILS to runway 27 and has briefed that approach. During descent, ATIS announces runway 09 and a new release note identifies an IAP amendment. The useful question is not simply “Are there NOTAMs?” It is whether the newly selected runway and approach remain authorized and how the amendment changes the flown procedure.

The crew first establishes the actual time of the amendment and whether it applies to the newly expected approach. A notice titled for runway 09 is not enough to know which procedure variant or minima changed. The PM reads the full text, identifies the chart affected and compares the new information with the available procedure and database. The PF retains the flight path and avoids an accelerated setup that compresses the cross-check.

The PM reads the full notice, checks its effective time and exact approach designation, and compares it with the current

chart. The PF and PM verify FMS selection, constraints, minima, missed approach, and landing performance under operator procedures. They request time or vectors if needed to complete the change safely. If the data do not agree, they do not construct their own hybrid procedure.

Learning point: changes to runway, approach, chart, and NOTAM relevance should be treated as one connected event. The earlier briefing remains useful history, but the new clearance requires a new shared plan.

If the amendment makes the intended approach unusable or cannot be reconciled through approved procedures, the crew requests time and space from ATC to choose another option. That may mean vectors, holding, a different approach, or diversion under the operator's procedures and fuel situation. The example's core lesson is that a runway change also changes which notices matter; both pilots must be able to explain the new plan before the critical segment.

08

Match NOTAMs to charts and loaded data

An EFB chart, an FMS navigation database, and an airport diagram can have different update cycles. A current subscription or green synchronization symbol does not prove that all three depict the same temporary condition. Compare the chart revision and the NOTAM's effective period whenever a procedure or movement area is affected.

Treat these as separate layers: the published procedure, a temporary amendment, the electronic chart presentation, and the loaded navigation path. They can disagree for legitimate timing reasons. The check should begin with the exact airport, runway, procedure title and revision, then compare waypoints, altitude constraints,

missed-approach information and minima where relevant. A chart that looks current may still need an FDC amendment applied.

The crew should keep separate questions in mind: Is the chart itself current? Has a NOTAM temporarily changed the charted procedure? Does the loaded navigation database represent the intended charted path? Is the aircraft authorized and equipped for that path? A "yes" to one question does not answer the others.

If an amendment affects approach minima, do not silently apply a number from a notice to an unrelated procedure variant. Confirm the exact runway, approach name, equipment and category, and use the operator's method for incorporating the amendment. Where ambiguity remains, seek authoritative clarification or choose another approved option.

The same discipline applies to departures and arrivals. A SID or STAR notice may alter an altitude, fix, transition, or chart note. Trace the amended instruction from clearance through chart and flight management system, with independent crew verification before the affected segment.

If a temporary change cannot be entered into the FMS as published, the crew must use only methods permitted by the aircraft and operator, or select another procedure. Avoid forcing a visual match by editing a route whose underlying procedure data remain uncertain. Explain which source controls each discrepancy and how it was resolved in the briefing; the other pilot should independently recognize the consequence.

09

Build an alternate that survives the actual restriction

A weather-qualified alternate can lose its practical value if the usable runway is closed, the required approach is unavailable, or airport services are restricted during the estimated alternate arrival window. Review alternate NOTAMs with the same attention to time and aircraft capability used at the primary destination.

Alternate review asks whether an aircraft can actually reach, approach, land and move at that airport in the expected period. Weather suitability alone is incomplete. A runway closure, approach outage, navigation limitation, rescue and firefighting restriction, or unavailable lighting can each affect that judgment depending on the operation. The operator's dispatch and regulatory criteria determine the formal alternate decision.

Consider a destination that remains suitable but a preferred alternate whose ILS is unavailable. The right conclusion depends on weather, other available procedures, runway performance, aircraft capability, the release and regulatory requirements. The notice raises a decision that dispatch and crew must resolve; it does not automatically prohibit the airport.

When delays or diversions alter arrival time, repeat the alternate scan. A notice that starts at 0200 UTC may be irrelevant to the original 0100 UTC alternate ETA and decisive after an hour of holding. Recompute the usable options before the flight reaches a fuel or routing decision point.

For international crews entering U.S. airspace, pay special attention to units, UTC windows, and the local airport identifier. A similar airport name or nearby navigation aid can make a correct notice appear to apply to the wrong

facility if its location line is skimmed.

Compare the alternate with the same changing circumstances that threaten the destination. A regional GNSS disruption could affect both airports; a construction program may remove a preferred runway at night; a delay may move the alternate arrival into a closure window. The crew should know a second option before the last convenient decision point, and coordinate a change with operational control as required.

10

A practical crew briefing model

Summarize NOTAM effects in four layers. First, name the flight element: departure surface, en route navigation, arrival procedure, or alternate. Second, name the temporary change and its valid window. Third, state the effect on the planned operation. Fourth, state the approved action or open question.

The summary should be short enough to be spoken in the cockpit but specific enough to support action. For each material item, identify the affected flight element, the notice's time window, the operational consequence, the changed plan, and the next check. The PM can retain the source detail while the PF confirms how the change affects the flight path or aircraft setup. A meaningful readback within the crew closes the loop.

Example: "Destination ILS 27 is unavailable through our ETA. We plan RNAV 27 if authorized and weather supports it; we have verified database, chart, minima and missed approach. If GNSS becomes unreliable, we need a different approach or destination." This is a reasoning pattern, not a substitute for actual operator and airport data.

Avoid vague phrases such as "NOTAMs checked" when a notice has an effect. The briefing should let the other pilot detect a missing consequence. If the PM believes a

runway closure affects taxi only and the PF sees a takeoff performance issue, discussing the concrete change exposes the mismatch early.

Record unresolved questions in the crew's normal workflow. Close each one with its source, action, and time of verification, especially when the departure is delayed or the clearance changes.

For example, a closed destination taxiway may require a different exit and a runway crossing after landing. The briefing would name the closure, the likely new route and its hold-short boundary, and the point at which the crew will obtain the actual ATC instruction. This is more useful than a generic statement that ground NOTAMs have been reviewed.

11

Crew review and final takeaways

For any relevant notice, each pilot should be able to state: what changed, where, when, how it affects the intended operation, and what action or verification closes the issue. The PM can track source and amendment details while the PF retains the flight path picture; operator role assignments govern the actual division of work.

During recurrent study, ask the crew to explain how a single change propagates. If an ILS becomes unavailable, what other approaches remain, which navigation sources do they require, what does the weather permit, and what happens to the alternate? If a runway closes after a delay, which performance, surface, fuel and release items must be reviewed? These questions test reasoning rather than recall of abbreviations.

Review questions: What would make a runway closure relevant after a delay? Why can an IAP NOTAM override a current-looking chart? When does a GPS testing notice require a navigation reassessment? Which airport

notices affect an alternate after touchdown? What event triggers a second NOTAM review in flight?

The professional standard is a traceable decision. Identify the notice, connect it to a flight element and time, make the required adjustment using approved procedures, and reassess when the flight changes.

A good debrief distinguishes detection from decision. The crew may have noticed a NOTAM yet failed to connect it to the selected procedure; it may also have made a safe change without documenting the source and time. The aim is a repeatable habit: find the relevant change, verify it against current official material, decide under approved procedures, and recheck when the plan or time changes.

Operational review card

1. Locate: Confirm airport or facility identifier, the named runway, taxiway, aid, procedure, or airspace, and whether the affected item is part of the intended flight.
2. Time: Compare effective start, end, and any daily schedule with departure, arrival, and alternate arrival estimates in UTC. Revisit the comparison after a meaningful delay.
3. Consequence: State what changes in the flight release, aircraft capability, runway and performance assessment, chart, taxi path, or FMS setup.
4. Cross-check: Read the original notice and compare the current chart, airport diagram, approved EFB data, ATIS, and clearance. Resolve differences before the affected phase.
5. Decide and monitor: Use approved operator processes to change the plan, brief both pilots, and define when a new NOTAM check becomes necessary.

Worked prompt: If the assigned landing runway changes during descent, which

previously screened notices now apply? If holding moves the alternate ETA across the start of a runway closure, what options remain?

Official sources and editorial scope

- FAA AIM 5-1-3, Notice to Airmen System
- FAA NOTAM Order, Scope and Keywords
- FAA Federal NOTAM System
- FAA NOTAM and TFR Information

Review current source material before operational use. Aircraft and operator procedures, regulations, flight release, and ATC clearances control the flight.

Reference links retained from the article

FAA AIM 5-1-3, Notice to Airmen System

https://www.faa.gov/air_traffic/publications/aim_html/chap5_section_1.html

FAA NOTAM Order, Scope and Keywords

https://www.faa.gov/air_traffic/publications/atpubs/notam_html/chap1_section_2.html

FAA Federal NOTAM System

<https://notams.aim.faa.gov/notamSearch/>

FAA NOTAM and TFR Information

https://www.faa.gov/pilots/safety/notams_tfr

FEATURE 03 | WEATHER INTELLIGENCE



NFA editorial illustration | Visual context, not procedural guidance

Weather Intelligence in the United States

What the Airline Pilot Needs to Know - from a useful briefing to timely decisions in flight.

[Read the public English edition online](#)

A U.S. weather briefing is useful only when it changes a flight decision. A METAR describes conditions observed at an airport. A TAF describes expected conditions during its validity period. A SIGMET alerts crews to specified hazardous weather over an area. Radar imagery helps locate precipitation, but a received image may already be old. These sources answer different questions. The crew's task is to combine them into a working picture for departure, the route, arrival, and a safe alternative.

This study explains a practical method for commercial and airline crews operating in U.S. airspace. It covers the core products, their limits, and the points at which a crew should update its plan. It does not establish dispatch, fuel, alternate, weather minimum, or thunderstorm clearance rules. The applicable regulations, flight release, aircraft manuals, company procedures, and current ATC clearances govern the operation.

01

Build a weather picture for the flight, not a collection of reports

Weather intelligence begins with the flight itself. A crew does not need to memorize every map, model, and weather code. It needs to understand which weather could affect **this aircraft, on this route, at this time**, and what choices remain if the forecast is wrong. The same rain area has different consequences when it is distant from the route, across an arrival gate, or moving toward the only practical alternate.

Begin with the flight's timeline. Place estimated departure, arrival, and alternate arrival times beside each product's observation, issue, and valid times. A graphic that shows a storm at 1800 UTC cannot simply be laid over a route the aircraft will cross at 2100 UTC. Compare forecast movement and new observations before deciding whether the hazard will still be there. This avoids a common error: treating a geographic picture as if it were a timeless fact.

Then identify the threat's mechanism. A low ceiling changes approach availability; crosswind and gusts affect runway selection and landing assessment; convection can obstruct a route and create turbulence, hail, lightning, and wind shear; icing may constrain altitude choices; turbulence can change passenger and cabin preparation. The crew

should describe the consequence, not just announce the name of the product containing the hazard.

A useful briefing sentence is: **“At our planned arrival time, the main risk is a line of convection west of the terminal; if it moves east sooner, our arrival and western alternate may both be affected.”**

That statement can be tested against later evidence and translated into an earlier reroute or a different alternate. “Weather looks bad” cannot.

Before departure, answer five questions in order:

1. **What can affect departure?** Review the latest airport observation, special reports, runway and approach information, terminal forecast, winds, significant weather, and nearby convective activity. Weather and non-weather airport restrictions belong in the wider preflight briefing.
2. **Where might the flight meet the hazard?** Place current observations, forecasts, advisories, and pilot reports on the actual route and at the planned flight levels. A hazard hundreds of miles away may matter if it is moving toward the route at the aircraft's estimated time of passage.
3. **What is expected at arrival time?** Compare the destination TAF with recent METARs and SPECIs. Check timing of changes, not merely the overall validity period. Consider the arrival window and any expected holding or delay.
4. **What options remain?** Identify usable routes, flight levels, arrival paths, and alternates under the operator's planning rules. A viable alternate is one that remains suitable when the same weather system reaches it.
5. **What would trigger a new decision?** Agree on practical cues: new convective development on the route, deteriorating

observations at destination or alternate, an adverse PIREP, an amended TAF, worsening braking or wind information, an extended delay, or reduced fuel flexibility.

This is a repeating cycle. The preflight picture is the starting point; changing weather requires a fresh comparison between what was forecast and what is now observed.

02

Know what each product can tell you

U.S. aviation weather information is organized around observations, analysis, advisories, forecasts, and tools. Each has a role in a commercial operation. An observation documents a condition at a place and time; a forecast estimates a future condition; an advisory calls attention to a specified hazard; a graphical tool places some of these products into a common view. None can answer all three questions of **what has happened, what will happen, and what the crew should do** on its own.

WEATHER PRODUCTS | COMPARISON

Source	Crew question it answers	Critical limit
METAR / SPECI	What was reported at this airport, and has a significant change been observed?	One location and one observation time; conditions between airports or later in the flight may differ.
TAF and amendments	What is forecast at the airport around the planned arrival or departure?	A forecast, with uncertainty in timing and intensity; compare it with actual trends.
PIREP / AIREP	What did an aircraft encounter at a stated place, time, and altitude?	The report is local and time-sensitive; aircraft type and altitude affect its relevance.
SIGMET, Convective SIGMET, G-AIRMET, CWA	Where are specified hazardous conditions occurring or expected?	Check the text, valid time, altitude, and area; the drawn boundary alone does not tell the full story.
GFA and other graphical forecasts	How might weather evolve along the route and at different times or levels?	Display layers and selected forecast times matter; a hidden layer can hide a hazard.
Radar imagery on an EFB or data link	Where was precipitation depicted, and how is the broad pattern developing?	Processing and delivery add delay; it cannot show a safe gap through a thunderstorm area.
ATIS, ASOS / AWOS, ATC and Flight Service	What newer terminal, observed, or operational information is available?	Each service has its own reporting cycle and scope; ask for clarification when a critical item is uncertain.

These products complement one another. For example, a TAF can support planning for a destination, while a recent SPECI reveals that the transition has already begun. A PIREP can show actual icing or turbulence at one level, while an advisory shows the larger area that may be affected. The operational meaning comes from their agreement, disagreement, timing, and relevance to the aircraft.

Observations versus forecasts

Observed conditions are evidence, not a guarantee of the next hour. A METAR can be favorable while an approaching storm has not yet reached the reporting site. Conversely, a deteriorating observation may show that an earlier favorable TAF is no longer a reliable description of the developing situation. Review consecutive reports, not just the latest one. Ask what changed, how quickly it changed, and whether nearby stations or radar and satellite information support the same trend.

U.S. units deserve deliberate attention.

Airport visibility is commonly reported in statute miles; wind is in knots and degrees true in the observation; altimeter settings in U.S. METARs are normally expressed in inches of mercury; report times are in UTC. Chart, EFB, and company display conventions may differ. A crew accustomed to meters and hectopascals should verify the unit shown before transferring a value into an operational calculation.

A **METAR** is a routine observation. A **SPECI** is issued when specified significant changes are observed; it deserves attention when conditions are moving quickly. Read wind, visibility, runway visual range when reported, ceiling, weather, temperature, and altimeter in the context of the intended runway and approach. Ask whether several successive observations support the forecast trend or contradict it.

A **TAF** is a terminal forecast, not a continuous observation. Read the validity period and each forecast change group against the actual estimated time of arrival. A favorable period earlier in the TAF does not establish the conditions at arrival. When the forecast and observed trend diverge, obtain updated information and reassess. Apply company and regulatory rules to any alternate or fuel consequences; a weather forecast alone does not settle dispatch suitability.

Pilot reports bring the atmosphere into focus

A pilot report is particularly valuable when the question is **what is happening at a flight level or on an approach path**. Suppose a recent report describes moderate icing in climb at a nearby location. The crew should compare its altitude and time with the planned climb, the temperature profile, the advisory area, and the aircraft's approved capability. The report does not prove icing exists at every point nearby, but it is direct evidence that deserves investigation.

Reports may also describe an absence of a forecast hazard. That is useful, but the interpretation remains narrow: one aircraft at one position and level did not encounter it at that time. A gap in reports may simply mean few aircraft have crossed the area or reported the conditions. If the crew encounters significant turbulence, icing, wind shear, or unexpectedly smooth conditions in a forecast hazard area, an accurate report helps other flights and weather forecasters.

A **PIREP** states what an aircraft encountered at a particular place, time, and altitude.

AIREPs may be made by crews or generated automatically by aircraft systems. For turbulence and icing, a recent report near the planned flight level can materially improve the picture. Check the report's age, position, altitude, aircraft type, and whether conditions are expected to move or change. The absence

of a report does not establish the absence of a hazard. Report significant encounters through approved channels so following crews receive useful evidence.

03

Read U.S. advisories as operational information

Advisories prompt investigation and planning; they do not prescribe an aircraft maneuver by themselves. Their names also do not encode a universal severity ladder for every aircraft. A moderate icing advisory may be critical for one operation and manageable under approved procedures for another. A CWA may identify a fast-developing terminal problem that matters more to the immediate flight than a large advisory far from its track.

SIGMET: Read the phenomenon and vertical extent in the text, then ask whether the flight intersects the area during the valid interval. A graphical polygon is a locator, not a promise that weather stops at its edge. Convective weather and non-convective hazards have different products; identify which applies to the route.

G-AIRMET: In the contiguous United States, these graphical forecasts depict specified hazards at discrete valid times. Check the selected time and altitude. If one frame is clear and the next is affected, consider that development can occur between frames. Do not infer a safe interval simply because no hazard is drawn on the first image.

CWA: Center Weather Service Units issue these advisories for weather meeting or approaching criteria, or to refine a broader product. A CWA may identify a line within a larger convective area or emphasize a major terminal. Its shorter validity makes it particularly relevant when a crew is approaching the affected airspace.

No advisory is not an all-clear. Issuance criteria, forecast uncertainty, scale, and rapidly changing conditions all limit what an advisory can capture. Continue to examine observations, aircraft reports, radar, forecasts, and information from ATC and operational control. If a new hazard appears, act on the evidence available rather than waiting for a product label.

A **SIGMET** describes specified en route weather that may affect the safety of aircraft operations. U.S. products include non-convective and Convective SIGMETs within the contiguous United States, with different arrangements in Alaska, Hawaii, and oceanic airspace. A **G-AIRMET** graphically depicts hazards such as moderate icing, moderate turbulence, IFR conditions, low-level wind shear potential, or strong surface winds over the contiguous United States. A **Center Weather Advisory (CWA)** gives shorter-range, local detail when hazardous weather meets or approaches advisory criteria, or when an existing advisory needs useful refinement. These are different warning layers, not an automatic ranking of how close the crew may safely operate to a hazard.

For each advisory, extract four items: **phenomenon, location, altitude, and valid time**. Then compare them with the aircraft's planned position and altitude at that time. Open the text as well as the map. The FAA handbook notes that the graphic boundary of a SIGMET may omit important details contained in its text. A CWA may highlight a developing problem near a major terminal before it becomes obvious in a broad national display.

Forecast graphics have distinct valid times. If a hazard appears at one forecast time but not the preceding one, do not assume the intervening period is hazard-free. The FAA specifically cautions users of CONUS G-AIRMETs to account for a change occurring

between forecast snapshots. The route may intersect the hazard before the later frame.

04

Use the U.S. tools deliberately

A practical AWC review starts with the planned route and time. Inspect current observations and pilot reports, then advance the GFA forecast time to the expected passage through each region. Examine convection, turbulence, icing, wind, and ceiling or visibility only as they relate to the flight. Toggle relevant advisory layers deliberately, read their text, and note the valid time. A screenshot without its selected time and layers can be misleading in a later crew discussion.

The GFA display can combine observations, forecasts, and advisories, but these layers have different meanings. An observed symbol is tied to an actual report. A forecast field is an estimate for a future time and region. An advisory highlights a defined hazard. When layers disagree, ask whether the difference reflects time, altitude, scale, or a forecast that has not matched observations. The disagreement itself can be useful evidence that the plan needs a wider margin or earlier update.

For a long route, the crew can make three short passes: a wide view to identify weather systems and route barriers; a closer view at the likely crossing time; and a terminal view for destination and alternates. The purpose is to find decisions, not to collect more colorful overlays. Record the threat, affected segment, timing, planned response, and source age in ordinary language.

The National Weather Service **Aviation Weather Center** at aviationweather.gov provides observations, forecasts, advisories, pilot reports, and the **Graphical Forecasts for Aviation (GFA)** tool. GFA helps crews examine weather by location, altitude, and forecast time. It is a way to organize several

kinds of evidence, not a separate observation of current conditions everywhere. Confirm which layers are switched on and which time is displayed before drawing a conclusion. The FAA warns that turning off an advisory layer can hide hazardous weather on a proposed route.

FAA Flight Service offers route briefings, an interactive map, and weather updates. The FAA handbook describes standard briefings for a complete picture, abbreviated briefings for a previous briefing that needs updating, and outlook briefings for departures six or more hours away. For airline crews, the dispatch or operational control process is central; public tools can help frame questions and cross-check changes within company policy. A Flight Service contact is not a universal requirement for every airline flight.

EFBs and commercial services can bring those products into the crew's workflow. Check the source, issue or observation time, forecast valid time, last successful update, and whether the product is suitable for the decision. An attractive display cannot remove a product's age or limitations. Not every in-flight service carries all weather or aeronautical information; a data link update supplements the full preflight briefing and other current sources.

05

Weather age is a flight-path issue

Latency is the time between the weather's occurrence and its display to the pilot. It can include observation, processing, packaging, transmission, and EFB rendering. A timestamp may refer to one stage of that chain rather than the instant the cloud or precipitation occupied the position shown. Check both the product time and the system's last successful receipt when the interface provides them.

Two weather displays can answer different questions. **Onboard radar** offers relatively current sensing in the direction scanned, subject to its own limitations, settings, geometry, and aircraft procedures. **Uplinked radar mosaics** provide a broad regional picture but include delay. They are valuable for identifying an early route around a convective area. The FAA explicitly warns against using data-linked NEXRAD as the sole means of selecting a path through nearby storms. Even the freshest-looking mosaic should not be treated as an onboard radar replacement.

The crew also needs to consider motion. A cell can grow vertically, expand laterally, or move across a previously open route while the aircraft closes the distance. An image that was useful for choosing an early strategic deviation can become unsuitable for a close tactical decision minutes later. Reassess against newer information and the actual outside or onboard picture before committing to a narrow path. Follow approved radar use, avoidance guidance, and ATC coordination.

The age shown beside a weather image is only part of the story. A phenomenon occurs, a sensor detects it, data are processed and distributed, and only then does an image appear on the EFB or cockpit display. The FAA handbook states that uplinked NEXRAD may be **5 to 15 minutes old or more**. The FAA Aeronautical Information Manual further cautions that the depicted weather may be older than the displayed image age.

Consider a line of storms crossing the planned route. A received mosaic may suggest an opening, yet the storms can develop or move while the data are assembled and delivered. The image is useful for deciding **early** whether to route around the entire area. It is unsuitable as the sole basis for choosing a close passage between cells. Before any deviation, use the aircraft's approved weather radar and other

available real-time cues, coordinate with ATC, and follow the operator's avoidance procedures. ATC assistance adds information; it does not transfer responsibility for an acceptable flight path from the crew.

A useful cockpit question is: **“Is this display recent enough, and detailed enough, for the decision we are making?”** A broad turn around a distant weather area allows time to update and verify. A narrow gap at close range demands information that a delayed mosaic cannot provide.

06

Make the decision before options become scarce

A weather briefing should produce a **decision trigger**. Examples include a second observation below the expected trend, an advisory moving toward the arrival gate, a reported hazard at the planned level, a route deviation that consumes a defined amount of fuel flexibility, or an arrival delay that moves the aircraft into a worse TAF period. The exact trigger depends on the aircraft, dispatch release, company policy, and circumstances. Its value is that the crew knows when to stop simply monitoring and start changing the plan.

Weather risk often combines with operational constraints. A proposed high-level route around convection may be unavailable because of traffic, fuel, or aircraft performance. A lower level may introduce icing or turbulence. Holding near destination can turn an adequate alternate forecast into a poor option by the time the aircraft reaches it. The crew should assess the combined route, fuel, time, and weather consequences with dispatch or operational control as required.

Clear crew roles help. One pilot maintains flight path control and monitors aircraft and ATC instructions; the other gathers and summarizes weather information when

workload permits. Both agree on the plan and its trigger. In demanding phases, request help from ATC or operational control and defer non-urgent EFB exploration. An excellent weather analysis that distracts the crew from flying has failed its operational purpose.

Weather affects more than the route line. A diversion around convection may add track miles, alter the arrival sequence, or reduce the margin available for holding. A change in wind can affect the runway, approach, and landing performance assessment. A worsening alternate can remove an option at the very moment it is needed. Consider the combined effect, with the dispatcher or operational control center as required.

A practical crew brief can use plain questions:

- **What is the main weather threat, where, and when?** State the hazard in relation to the aircraft's planned position and flight level.
- **What evidence supports the picture?** Name the observations, forecast, advisory, reports, and their times. Flag important disagreement.
- **What is the preferred plan?** Include the route, level, departure or arrival adjustment, and the expected ATC coordination.
- **What is the next safe option?** Identify a viable alternate or wider reroute and the point at which it should be chosen.
- **When will we review it again?** Set a time or event that brings the decision forward.

In flight, compare the latest actual conditions with what the crew expected. If the weather develops faster, the route closes, or an arrival delay changes the forecast arrival window, update the plan while choices remain. Keep flight path control, aircraft configuration, communication, and workload management in the normal crew roles; a lengthy EFB review must not displace immediate flying tasks.

07

Worked example: a destination forecast that is losing credibility

This scenario shows how several weather sources can disagree without one necessarily being “wrong.” The TAF was issued earlier and addresses the airport at a forecast time. The SPECI is a newer observation at the airport. The CWA concerns a developing regional hazard. A PIREP describes an actual encounter at a particular level. The radar mosaic can show the precipitation pattern, but with delay. The crew should preserve these distinctions when it briefs the threat.

Initial plan: Destination arrival is expected within the favorable TAF period. The release includes an alternate and sufficient fuel under applicable rules. The crew has reviewed the broad convective forecast, expecting any storms to remain to the west.

New evidence: The destination reports lower ceiling, a SPECI confirms further deterioration, and a recent aircraft report describes turbulence on descent. A CWA now includes part of the arrival region. The older uplinked mosaic does not show the same degree of development. The correct conclusion is not that the image disproves the advisory; it is that the sources represent different places, times, and phenomena.

Decision point: The crew determines whether the route and arrival remain suitable, what newer observations and amended forecasts say, whether the alternate will remain outside the same system, and how a deviation or delay affects usable fuel. It can seek a route change or updated arrival information before committing to the constrained area. A diversion decision follows approved policies and the actual operation. The key training question is **when** the crew recognizes that the initial weather picture no

longer supports the same plan.

The following is a **training illustration**, not actual weather data or a dispatch calculation.

A crew is two hours from a U.S. destination. The earlier TAF forecast usable arrival conditions. A newer observation now reports a lower ceiling, and a SPECI shows further deterioration. Nearby PIREPs describe moderate turbulence in descent. The GFA shows an area of thunderstorms developing west of the airport; a recently issued CWA covers part of the arrival area. The EFB radar mosaic looks less threatening than the advisory, but its receipt time shows it is delayed.

The crew first establishes **what changed**: observations are already worse than the earlier forecast, and the advisory shows a developing regional threat. The radar mosaic cannot settle the conflict because it depicts older precipitation information. The crew then requests current destination and alternate information, checks updated TAFs and advisories, considers ATC's arrival and deviation constraints, and coordinates the fuel and diversion consequences with operational control under company procedures.

The action depends on actual conditions, aircraft capability, fuel, and applicable rules. The teaching point is the **timing of the decision**. The crew should define the condition that would cause a reroute or diversion while both options remain available; it should not wait for the aircraft to reach the weather boundary before deciding what the older image means.

08

Practical review before departure and before arrival

A checklist can support the briefing, but it cannot replace interpretation. Two flights may receive the same products and need different decisions because their arrival times, aircraft capabilities, alternates, and fuel positions differ. Use the following review as a conversation between crew members, integrated with the operator's normal procedures.

Before departure: Confirm the latest observations and forecast at departure, destination, and applicable alternates; examine route and altitude hazards; read relevant SIGMETs, G-AIRMETs and CWAs in full; review recent pilot reports; note product and valid times; agree on the route or altitude options and triggers for reassessment. Refresh the picture when a delay or significant change makes the original briefing stale.

Before descent: Obtain the latest ATIS or terminal weather, observations, and forecast updates; review changing winds, visibility, ceiling, convection, turbulence and any icing or wind shear concerns; check the planned approach and alternate options; evaluate current fuel and delay implications under company procedures. Communicate a change of plan early enough for ATC and the crew to manage it safely.

09

Additional cockpit scenarios for discussion

A thunderstorm line across the planned route

A broad forecast showed scattered convection. During cruise, new advisories and pilot reports indicate that storms have formed a continuous line ahead. An uplinked mosaic appears to contain a gap. The crew checks its age and recognizes that the apparent gap may already have closed. It seeks a broad deviation early, checks fuel and alternate consequences, coordinates with ATC, and applies approved onboard radar and avoidance guidance. The decision is driven by the line's position and movement at the time of crossing, not by a single attractive image.

Icing along a proposed lower route

ATC offers a lower altitude around a weather area. A recent PIREP reports icing near that altitude, while a G-AIRMET indicates moderate icing over part of the same region. The crew compares the report's location, level, and age to the proposed segment; checks aircraft and company guidance; and considers a different altitude or route. The advisory and report inform the assessment, but aircraft-specific procedures govern whether the proposal is acceptable.

The alternate under the same system

The destination begins to deteriorate, and the crew considers its filed alternate. The latest TAF for that airport still looks favorable, but a broad weather view suggests the same frontal boundary will reach it near the projected diversion arrival time. A nearby second option may be outside the system. The crew updates the projected diversion timing and fuel consequences with operational control. Merely naming an alternate is less useful than establishing that it remains a practical option when needed.

10

Lessons for continuous pilot development

The weather products will evolve, but three habits remain useful. **First, connect every product to position, altitude, and time.** A report without those details has limited value for a flight-specific decision. **Second, look for change.** A sequence of observations and amendments may matter more than one favorable report. **Third, preserve options.** Weather planning succeeds when the crew recognizes a threat while there is still room to reroute, delay, change level, or divert under approved procedures.

In a crew debrief, review the evidence and timing rather than judge the outcome alone. Which product first signaled the change? Was the information current when the decision was made? Did the crew distinguish forecast from observation? Was the alternate still available at the revised arrival time? Were ATC and operational control involved early enough? These questions strengthen TEM, situational awareness, communication, and flight path management without turning the article into a manufacturer-specific procedure.

Final review

1. What can a current METAR tell you that a TAF cannot, and what can a TAF tell you that a METAR cannot?
2. Why must the time of an advisory be compared with the aircraft's estimated passage time?
3. What details in a PIREP make it relevant or less relevant to your planned flight level?
4. Why is a data-linked radar mosaic appropriate for a broad reroute but unsuitable as the sole guide through nearby cells?
5. If actual conditions deteriorate faster than forecast, what will trigger a new destination or alternate decision?

Key takeaway: The goal is to recognize a changing threat early enough to keep safe options open. Combine observed conditions, forecasts, advisories, and crew reports; respect each product's age and limits; and revisit the flight plan when reality diverges from the briefing.

Official sources and editorial scope

Primary technical source: FAA, Aviation Weather Handbook, FAA-H-8083-28B, 2 April 2026, especially Chapters 3 (weather information and latency), 24 (observations and pilot reports), 26 (advisories), 27 (forecasts), and 28 (GFA and Flight Service tools). [FAA Aviation Weather Handbook](#)

Additional official sources: FAA, Aeronautical Information Manual, Chapter 7, Section 1, for weather information services and thunderstorm avoidance: [FAA AIM Chapter 7](#) ; NOAA/NWS Aviation Weather Center, product information and current tool access: [Aviation Weather Center](#) and [product information](#) . Consult current editions and live products for operational use.

This NFA educational interpretation is intended for commercial flight crew development. It does not replace the FAA's source documents, an operator's dispatch and operational control, approved aircraft guidance, SOPs, or real-time weather information. Product interfaces and procedures may change; review official sources before publication updates.

Reference links retained from the article

aviationweather.gov

<https://aviationweather.gov/>

[FAA Flight Service](https://www.1800wxbrief.com/)

<https://www.1800wxbrief.com/>

[FAA Aviation Weather Handbook](https://www.faa.gov/sites/faa.gov/files/FAA-H-8083-28B.pdf)

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[FAA AIM Chapter 7](https://www.faa.gov/air_traffic/publications/ATpubs/AIM/aim0701.html)

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[Aviation Weather Center](https://aviationweather.gov/)

<https://aviationweather.gov/>

[product information](https://aviationweather.gov/help/data/)

<https://aviationweather.gov/help/data/>

FEATURE 04 | AIRPORT SURFACE SAFETY



NFA editorial illustration | Visual context, not procedural guidance

Airport Surface Safety in the United States

Taxi clearances, runway crossings and runway protection.

[Read the public English edition online](#)

01

Treat taxi as a controlled phase of flight

Before movement, establish three shared facts: present stand or location, assigned runway or destination, and the complete cleared taxi route. The chart should be displayed at a usable scale with the aircraft position understood. A moving map supports orientation but does not replace signs, markings, verbal clearance, and outside observation.

Treat the movement area as a sequence of commitments. Before brake release, identify the present stand, the first taxiway, the assigned destination and every runway boundary on the likely route. The airport diagram must be large enough to read taxiway letters, hot spots and hold positions. A moving map is a helpful position cue, but signs, markings, clearance and outside observation remain essential when the displayed position or map freshness is uncertain.

Review the current diagram, hot spots, construction or closures in NOTAMs, and ATIS. The FAA advises copying the taxi clearance and tracing the route before releasing brakes. Identify runway crossings, hold-short points, complex intersections, and any point where the crew expects to change frequency or head down for a checklist.

Use a concise taxi brief: “We are at gate B12, taxi via B and E to runway 27L, hold short 27R, hot spot at E3. I will call both runway boundaries; we will stop if the chart and signs disagree.” This is a training example, not a clearance or a route at any actual airport.

Workload rises as the aircraft starts moving. Arrange checklists, FMS tasks and cabin coordination so both pilots can maintain awareness during turns and near runways, consistent with SOP. If a task draws the PM's

attention inside, the PF should know that the usual cross-check is temporarily reduced and adjust pace accordingly. A deliberate stop for clarification is preferable to continuing while the route is being reconstructed.

02

Map the clearance to physical boundaries

A taxi instruction is an ATC authorization with specific limits. The crew should locate each taxiway in sequence and identify every runway boundary on the diagram. The FAA states that taxi to an assigned departure runway does not itself authorize entering or crossing that runway. Explicit authorization is needed for each runway crossing at a towered airport.

Crossing a runway is a distinct clearance event. FAA guidance requires an explicit instruction for each runway that intersects a taxi route, including a closed or inactive runway. A clearance to taxi toward a departure runway does not by itself permit crossing an intervening runway or entering the departure runway. Mark the exact hold line on the diagram, then compare it with the sign and pavement marking before moving across.

At a runway holding-position marking, read the sign and runway designation and verify the intended direction and location. A hold-short instruction is a boundary, not a suggestion to stop near the pavement. If a clearance seems to omit a crossing or conflicts with the chart, stop in a safe place and ask ATC.

Runway crossing readbacks and hold-short readbacks are essential opportunities to catch wrong-runway and wrong-aircraft assumptions. Both pilots should monitor the exchange, especially when multiple similar call signs are present. The pilot taxiing should remain oriented outside while the other pilot

manages charts and radio under the operator SOP.

When reading back a crossing instruction, use the runway designation and call sign under the applicable phraseology and SOP. Both pilots should listen for a wrong runway number, a similar call sign or an omitted hold-short restriction. Before crossing, visually check for traffic even when a clearance has been issued. If the aircraft approaches a boundary before the clearance is understood, stop short and ask ATC.

03

Use hot spots as a briefing prompt

FAA hot spots mark areas with a history or potential of collision or runway incursion due to complex geometry, confusion, or other local conditions. Their symbology draws attention to a place, not to every possible hazard at the airport. Open the accompanying description when available; a symbol alone may not explain the trap.

A hot spot is a prompt for a more detailed local brief. Study which route branches or runway boundaries create the potential for confusion, then describe the actual turn and hold point. A marked hot spot may cover several taxiways; the symbol alone does not tell the crew which turn ATC will assign. The risk can also shift as construction or a closure changes the normal flow.

At a hot spot, slow enough to identify signs and turns, verify the crossing or hold-short instruction, and keep heads up. If the taxi route changes unexpectedly, stop and redraw it rather than trying to follow memory while rolling. Construction and temporary closures can create new complexity that the standard diagram alone will not show.

A shared phrase helps: “Hot spot ahead; next left is E, then hold short 27R.” The second pilot

should confirm the position using diagram and outside cues. If those cues disagree, a stop is the correct operational reset.

At the hot spot, compare at least two independent position cues where available: a sign and pavement marking, a charted intersection and outside geometry, or a known turn sequence and runway designation. If one cue disagrees, stop at a safe location and report position accurately. Do not let the moving map become the only evidence, particularly at night or when display scaling hides an adjacent connector.

04

Separate ATC clearance from runway status indications

Runway Status Lights, where installed, use surveillance inputs to warn that entry, crossing, takeoff, or landing may be unsafe. The FAA AIM states that these lights are an independent safety enhancement and do not issue or replace an ATC clearance. An extinguished light is not permission to enter a runway.

Runway Entrance Lights and Takeoff Hold Lights are part of an independent runway status system at equipped airports. A red indication warns that entry or takeoff may be unsafe even if a verbal clearance was received. An extinguished indication is not a clearance. Crews must reconcile any apparent conflict using the applicable FAA and operator procedure, including communication with ATC, before acting.

A red Runway Entrance Light indication is a reason to remain clear and contact ATC if a clearance and the light disagree. Crews should know the operator and FAA procedures for red indications in the context of the aircraft’s position. The system can be unavailable; absence of red is never proof that the runway is clear.

At airports with other lighting systems or low-visibility procedures, review the applicable diagram and local instructions. The meaning of a visual cue depends on its type; do not generalize from one red-light system to every airport or operation.

Visual aids have different functions. Yellow runway guard lights draw attention to the runway intersection; green taxiway centerline lights guide along a path; a red stop bar or a red runway status indication has its own operating rule. They should not be blended into a single general idea of 'lights permitting taxi.' Review the specific airport's equipment, NOTAMs and low-visibility procedures before relying on a visual cue.

05

Protect the transition to takeoff

The move from taxi to line-up-and-wait or takeoff clearance concentrates risk. Confirm the runway designation using the holding-position sign, chart, heading, and available cues before entry. An intersection departure also changes available runway length and may require a new performance confirmation under the operator's method.

At the departure runway, connect four independent checks: the clearance names the runway; the sign and marking identify the actual boundary; the heading and external cues support alignment; and the aircraft performance and configuration match the actual entry point. An intersection departure can reduce available distance, so the performance calculation and intended taxi entry must agree. If any element disagrees, stop the sequence and resolve it before takeoff.

"Line up and wait" authorizes entry and waiting, not takeoff. If held on the runway unusually long or if a conflict appears, contact tower; FAA best practices recommend a query after more than 90 seconds in position. Before

any takeoff, verify an explicit clearance for the correct runway and resolve a doubtful call sign or instruction.

The goal is to connect clearance, position, and aircraft state. A correct FMS runway selection does not establish that the aircraft is physically on that runway. A correctly identified sign does not replace takeoff performance for the actual intersection.

Line up and wait is a temporary position on an active surface. Continue monitoring ATC, runway traffic and the time spent there. FAA pilot best practices recommend contacting the tower if the aircraft has been holding in position for more than 90 seconds or if a conflict appears. The crew should verify the takeoff clearance itself and its runway designation before applying takeoff thrust.

06

Maintain control after landing

The landing roll is not the end of runway protection. The entire aircraft must pass the runway holding-position marking before it is clear of the runway. Do not exit onto another runway without specific ATC direction. Continue to monitor position, crossing limits, and traffic as the crew changes from landing to taxi tasks.

After landing, the crew remains on the runway until the entire aircraft is beyond the holding-position marking. A turn off the runway may put the aircraft immediately near another runway, an intersecting taxiway or a complex ramp entrance. Assess the exit before beginning a high-workload after-landing flow. If ATC issues a route while the aircraft is still decelerating, capture the instruction and clarify any part that is uncertain.

Delay nonessential after-landing cockpit work until the runway has been vacated and the taxi clearance is understood, consistent with

operator procedures. An unexpected exit may put the aircraft at a hot spot or near another runway; stop if needed and rebuild the surface route.

At night or after a long flight, similar taxiway letters and a familiar gate can invite assumption. Check the new route against current closures and construction, even if the crew previously operated at the airport.

The departure brief and arrival taxi brief should not be treated as interchangeable. The airport may use different flow, exits and construction restrictions on arrival. Once clear, identify the actual exit on the diagram, obtain or confirm the onward clearance and rebrief any runway crossing. This preserves the same boundary discipline all the way to parking.

07

Worked example: a clearance changes at a hot spot

A crew has briefed taxiway B to a runway 27L departure. Ground changes the route to taxiway E via E3 near a marked hot spot and includes a hold-short instruction for runway 27R. The airport is unfamiliar and the first officer is completing an EFB task.

The route change has two effects: the crew must identify E3 correctly, and it must preserve the new runway 27R hold-short limit. The PM can read back the full amended clearance and trace it on the diagram, while the PF retains control and locates a suitable place to slow or stop. Only after both pilots agree on present position and the next boundary should the aircraft continue.

The crew copies the amended clearance, stops or slows in a safe place, locates E3 and runway 27R on the diagram, and briefs the new hold-short boundary. The PM returns attention outside before the turn. Approaching the marking, both pilots confirm the sign and instruction; they do not cross without a

specific crossing clearance. If the sign and diagram disagree, they stop and request clarification.

Learning point: the amended clearance invalidated the old taxi brief. The crew's task is to rebuild the shared surface picture while preserving position awareness, not to continue on the earlier mental route.

If the clearance is addressed to another aircraft with a similar call sign, or if E3 is not where the crew expected, do not improvise a turn based on likely intent. Ask ground to repeat or confirm the route and give the current position. The training measure is whether the crew detects loss of shared position awareness early enough to keep the aircraft short of the runway.

08

Communicate clearly when the route changes

Surface communication carries many similar elements: a call sign, runway assignment, taxiway sequence, crossing clearance, and hold-short point. Read back the runway and every hold-short instruction clearly; use the exact runway designation. When another aircraft has a similar call sign, both pilots should listen through the whole exchange before acting.

A complex instruction should be broken into the route and its limits: current position, taxiway sequence, destination, and each hold-short or crossing instruction. A frequency transfer is a communications change, not permission to pass an uncleared boundary. 'Follow that aircraft' supplies a traffic reference, but the crew still needs its own clearance applicable to the runway ahead.

An ATC instruction to follow another aircraft provides a traffic reference, not a runway crossing clearance. A short taxi route or a ground frequency change also does not erase

a hold-short boundary. When the crew cannot place an instruction on the diagram, ask ATC to repeat or clarify while stopped in a safe location.

If disoriented, tell ATC promptly and request detailed or progressive taxi instructions. A moving map may help regain awareness, but do not steer solely by a displayed icon if the outside signs or pavement location disagree. A clear position report gives ATC a better basis to help.

Use concise crew callouts at boundary points: assigned runway, actual sign, intended turn, and crossing status. The callout is useful when it forces each pilot to compare an independent cue, not when both simply repeat the same mistaken assumption.

When requesting progressive taxi, state why the help is needed and where the aircraft is holding. Step-by-step instructions can reduce uncertainty, but the crew must still verify signs, markings and each runway clearance. After a route amendment, both pilots should repeat the next turn and boundary in plain terms; this is especially helpful when an abbreviated readback omitted a detail of interest.

09

Manage workload, visibility, and unfamiliar geometry

Complexity rises when a taxi clearance arrives while the crew is programming an FMS, reviewing performance, or responding to a late gate change. Schedule nonurgent head-down work away from runway boundaries. If a task cannot be completed safely while moving, stop where permitted and coordinate with ATC.

At night or in reduced visibility, the same airport diagram can feel less familiar. Signs and markings may be visible later, while reflections, temporary barriers or similar

taxiway names can increase ambiguity.

Reduce speed to preserve time for identification and allow the PM to compare the chart with outside cues. The appropriate pace is the one that keeps the next decision within the crew's available attention.

At night, in rain, or during low visibility, the diagram and signage may be harder to reconcile. Reduce taxi speed as appropriate, use approved low-visibility taxi routes and charts, and identify stop bars or other locally applicable cues. The crew must still understand the clearance and maintain separation; lighting is an aid with defined limits.

Construction changes the visual picture: a normally open taxiway can be blocked, temporary signs may appear, and the shortest route may no longer exist. Review the current NOTAM and ATIS information before taxi. When the actual field condition differs from the briefing, stop and seek clarification rather than navigating around a closure by intuition.

Fatigue can be especially relevant after landing. The crew may feel the high-workload phase is over, while a crossing or hot spot remains ahead. Keep the sterile cockpit and positive position monitoring through the full taxi to parking under company policy.

Low visibility procedures, construction zones and deicing routes can also change the normal taxi path. Read the current NOTAM and ATIS information and follow local and operator procedures. If position becomes uncertain, hold the aircraft in a safe place and tell ATC. A pause costs time but prevents a guess at a runway boundary from becoming an incursion.

10

Use surface threats in EBT and recurrent training

A useful scenario begins with a normal taxi plan and adds one realistic change: a late runway reassignment, closed taxiway, similar call sign, or an instruction near a charted hot spot. The instructor observes how the crew updates its shared position, distributes tasks, catches ambiguity, and decides to stop or seek clarification.

An EBT scenario should place a credible threat at a specific decision point, such as an amended taxi route near a hot spot while one pilot is working inside the cockpit. Observable behaviors include confirming the aircraft's location, restating the route, recognizing the runway boundary, managing workload, requesting clarification, and stopping when evidence conflicts. The scenario's success is measured by the crew's management, not merely by whether it reaches the correct taxiway.

Evidence should describe observable behavior. Examples include: both pilots verified the runway holding-position sign against the assigned runway; the crew stopped when the taxiway designation did not match the diagram; the PM requested a repeat of an unclear crossing instruction; or the crew resumed movement before the amended route was understood.

In debriefing, connect the threat to the crew's management of it. Which cue first contradicted the expected route? What did the crew say to each other? Was ATC told about the uncertainty early enough? Did the crew protect aircraft movement while resolving an EFB or chart issue?

The transferable skill is not memorizing one airport. It is preserving a verified chain from clearance to diagram to outside sign to

physical aircraft position, and pausing movement when that chain breaks.

Debrief both pilots' contributions. Did the PF control pace and stop before a boundary? Did the PM recognize and communicate the conflicting cue in time? Was the revised clearance independently checked, or did both pilots repeat the same assumption? Discuss how the crew recovered shared awareness and what would transfer to an unfamiliar U.S. airport.

11

Crew review and final takeaways

At every critical surface boundary, ask: Where are we? What clearance do we actually have? What marking or sign is next? Is the runway occupied or protected by an illuminated status light? What does the current airport information change?

For self-review, trace a hypothetical route through the airport diagram and name each point at which the crew needs a new decision or specific clearance. Add a closure and an ATC amendment, then explain how the route, position cross-check and workload plan change. The objective is to keep the physical aircraft location aligned with the clearance and chart throughout movement.

Review questions: Why does taxi to a runway not authorize runway entry? What is the operational use of a hot-spot description? What does an extinguished runway status light mean? When is an aircraft fully clear of a runway after landing? How should the crew handle an amended taxi clearance near a complex intersection?

The professional standard is deliberate movement: review the diagram and current conditions, translate the clearance into physical boundaries, keep both pilots aware of the aircraft's position, and stop to resolve uncertainty before the boundary.

A strong surface brief is short, but it contains the consequential facts: current location, assigned route, runway boundaries, hot spots, planned runway entry and a clear stop-and-query trigger. The same method applies after landing, when fatigue and cockpit tasks can erode attention. Deliberate movement begins with a shared plan and ends only after parking.

Official sources and editorial scope

- [FAA Pilot Best Practices for Airfield Safety](#)
- [FAA AIM 4-3, Airport Operations](#)
- [FAA AIM 2-1, Runway Status Lights](#)
- [FAA Runway Safety Pilot Resources](#)

Review current source material before operational use. Aircraft and operator procedures, regulations, flight release, and ATC clearances control the flight.

Reference links retained from the article

[FAA Pilot Best Practices for Airfield Safety](#)

https://www.faa.gov/airports/runway_safety/pilots/best_practices

[FAA AIM 4-3, Airport Operations](#)

https://www.faa.gov/air_traffic/publications/atpubs/aim_html/chap4_section_3.html

[FAA AIM 2-1, Runway Status Lights](#)

https://www.faa.gov/air_traffic/publications/aim_html/chap2_section_1.html

[FAA Runway Safety Pilot Resources](#)

https://www.faa.gov/airports/runway_safety/pilots

FEATURE 05 | TRAFFIC & COLLISION AVOIDANCE



NFA editorial illustration | Visual context, not procedural guidance

When TCAS Commands

Understanding Traffic Advisories, Resolution Advisories and the pilot priorities that protect both aircraft during a time-critical encounter.

[Read the public English edition online](#)

Two aircraft can be operating under air traffic control, flying correctly programmed routes and complying with clearances, yet still move toward an unsafe encounter. Airborne Collision Avoidance System equipment provides an independent final layer of protection when separation has already become uncertain or insufficient.

RECOGNIZE → PRIORITIZE → RESPOND → MONITOR → REPORT → RECOVER

That protection depends on pilots recognizing the level of alert, applying the correct priority and flying the required response without hesitation, overreaction or improvisation.

SCOPE

This article explains the operational logic of Traffic Advisories and Resolution Advisories without reproducing aircraft-specific procedures. The applicable AFM, FCOM, QRH, SOPs, operator training and regulations remain controlling at all times.

01

ACAS is an independent safety layer

Airborne Collision Avoidance System, or ACAS, is a family of airborne systems designed to reduce the likelihood of a mid-air collision. TCAS is the name widely used for specific implementations of that concept.

ACAS operates independently of the ground-based air traffic control system. It monitors nearby transponder-equipped aircraft and evaluates whether their relative positions are converging toward a hazardous closest point of approach.

ACAS I provides Traffic Advisories. ACAS II systems, including TCAS II and ACAS Xa, provide Traffic Advisories and Resolution Advisories. An RA recommends a vertical maneuver or restriction intended to maintain or increase separation from the threat aircraft.

PRINCÍPIO OPERACIONAL

ACAS does not replace ATC separation, visual lookout or procedural compliance. It adds a final airborne defense.

02

Traffic displays provide a picture, not a clearance

The traffic display improves situational awareness. Depending on the installation and available surveillance data, it may show relative bearing, range, altitude, vertical trend and threat status.

Displayed bearing may lack the precision needed for close visual interpretation. A target may be outside the selected range, without usable altitude reporting or absent because its transponder is not operating.

Pilots must resist using the display as a tactical navigation instrument. A crew should not create its own avoidance turn, climb or descent merely because a traffic symbol appears uncomfortable.

OPERATING PRINCIPLE

The display supports awareness. The approved alert and procedure determine the response.

03

A Traffic Advisory prepares the crew

A Traffic Advisory identifies an aircraft that may become a collision threat. Its purpose is to alert the crew, assist visual acquisition when practical and prepare both pilots for a possible RA.

A TA changes the crew's attention, not the aircraft's flight path by itself. European and FAA guidance state that pilots should not maneuver solely in response to a TA.

- Acknowledge the alert according to the operator's callout standard.
- Direct attention to the traffic display and outside scan as appropriate.

- Confirm the current flight path, modes and clearance.
- Prepare for a possible Resolution Advisory.
- Avoid abrupt changes that could complicate the encounter.

Visual contact may help, but the traffic seen outside may not be the aircraft generating the alert. Night, cloud and relative motion can make visual interpretation unreliable.

04

A Resolution Advisory changes the priority

A Resolution Advisory indicates that ACAS has calculated a collision threat requiring vertical guidance. The system may require a climb, descent, vertical-speed adjustment, maintenance of a vertical rate or avoidance of a particular vertical maneuver.

Some RAs require an active flight-path change. Others restrict movement that would reduce separation. The exact display, aural annunciation and flight guidance depend on the installed system.

RA PRIORITY

The Pilot Flying should respond immediately by following the RA as indicated, unless doing so would jeopardize aircraft safety.

The response should remain within the guidance shown by the approved display and procedure. Excessive pitch or vertical speed can introduce unnecessary aircraft-state risk.

05

The RA prevails over a conflicting ATC instruction

ATC may issue an instruction without knowing that the aircraft has just received an RA. The controller and the airborne system use different information, logic and time horizons.

If an ATC instruction conflicts with an RA, pilots follow the RA. ICAO guidance also states that pilots must not maneuver in the direction opposite to the RA.

Two ACAS-equipped aircraft can coordinate complementary RAs. One may receive climb guidance while the other receives descent guidance. Ignoring an RA or maneuvering in the opposite sense can destroy the coordinated solution.

PRINCÍPIO OPERACIONAL

During the RA, immediate collision-avoidance guidance has operational priority.

06

Correct response means prompt and proportional

A delayed response allows the encounter to continue closing. An excessive response may create altitude deviation, unnecessary loads, secondary conflict or loss of energy.

The crew should follow the commanded sense and keep the vertical rate within the permitted guidance shown by the installed system. The response should not become more aggressive than necessary.

Startle may produce hesitation while the pilot tries to diagnose the traffic, or abrupt control input driven by urgency. Training must develop a third response: prompt recognition followed by measured control.

The aircraft remains subject to its operating limitations. Aircraft-specific alert priorities must come from approved procedures and training.

07

Follow every change in the RA

An RA can change as the encounter develops. The system may strengthen, weaken, reverse or otherwise modify the original guidance.

The first response does not complete the task. The Pilot Flying must continue monitoring the presentation and comply with any change according to the approved procedure. A reversal is especially time-critical because continuing the original maneuver may rapidly destroy the intended separation.

The Pilot Monitoring supports this process by monitoring the RA, checking the flight path, making required callouts, watching aircraft limits and handling communication when workload permits.

MONITORING DISCIPLINE

Do not continue interpreting the first command after the system has issued a new one.

08

PF and PM duties must remain clear

An RA compresses control input, flight-mode awareness, vertical-speed monitoring, traffic interpretation and communication into a short period.

The Pilot Flying concentrates on flying the RA accurately. The Pilot Monitoring verifies the response, announces deviations or changing guidance, monitors other threats and communicates with ATC when appropriate.

Useful CRM behaviors include short callouts, explicit task ownership and immediate correction of any response in the wrong sense. Long explanations should wait until the flight path is protected.

AUTOMATION

Automation handling varies by aircraft. Use only the TCAS response capability approved for the aircraft and operator.

09

Communication supports the maneuver

Flying the RA takes priority over transmitting a report. When workload permits, the crew should notify ATC using the phraseology prescribed by the applicable authority and operator, commonly beginning with “TCAS RA.”

Once the conflict is clear, the crew should promptly return toward the assigned clearance or comply with a subsequent amended clearance, as applicable. ATC should receive the appropriate “clear of conflict” report.

The report explains the departure from the clearance, confirms that the collision-avoidance response ended and states what flight path the crew is now following.

10

The most common pilot traps

- **Waiting for visual confirmation.** The crew may lose time or identify the wrong aircraft.
- **Following ATC against the RA.** The controller may not know that the RA exists.
- **Maneuvering on a TA.** A TA prepares the crew but does not provide maneuver guidance.
- **Overcontrolling.** Excessive vertical speed can move beyond the required response.
- **Treating the first RA as final.** Guidance may strengthen or reverse.
- **Returning too early.** Maintain RA guidance until the system indicates that the conflict has ended.

11

Preventing unnecessary RAs

Collision avoidance begins before an alert. Crews can reduce unnecessary encounters through accurate altitude control, correct transponder and ACAS modes, compliance with restrictions and controlled vertical rates when approaching an assigned level with known adjacent traffic.

European guidance recommends that, when pilots know another aircraft is at or approaching an adjacent level, the last 1,000 feet of climb or descent should normally use a rate below 1,500 feet per minute unless ATC instructs otherwise. Operators should define the applicable procedure.

This technique does not weaken the need to comply with an RA. It reduces the chance that normal level-off geometry will appear as an urgent conflict.

12

Training must produce the correct instinct

Pilots need recurrent exposure to encounters with changing vertical rates, conflicting ATC instructions and revised RAs. Training should verify that crews distinguish TA from RA, avoid maneuvering solely on a TA, respond promptly and proportionally, follow reversed guidance and preserve clear PF and PM roles.

1. A traffic display supports awareness but does not provide separation authority.
2. A TA prepares the crew. It does not justify a maneuver by itself.
3. An RA requires immediate and accurate response unless aircraft safety would be jeopardized.
4. Follow the RA even when it conflicts with an ATC instruction.

5. Never maneuver in the direction opposite to the RA.
6. Monitor for strengthened, weakened or reversed guidance.
7. Use only the automation response approved for the aircraft and operator.
8. Return to the clearance and notify ATC after the conflict is clear.

RECOGNIZE → PRIORITIZE → RESPOND
→ MONITOR → REPORT → RECOVER

Official references

1. ICAO. *ACAS operating procedures and response to Resolution Advisories*.
2. Federal Aviation Administration. *AC 90-120 - Operational Use of Airborne Collision Avoidance Systems*, 20 November 2024.
3. European Union Aviation Safety Agency. *AMC and GM to the Rules of the Air - guidance associated with SERA.11014*.
4. European Union Aviation Safety Agency. *SIB 2013-11 - ACAS II Manoeuvres Based on Visual Acquisition of Traffic*.

EDUCATIONAL USE

This publication supports professional pilot development. It does not replace regulations, ATC procedures, operator manuals or training, or aircraft-specific AFM, FCOM, FCTM, QRH and SOP guidance. The applicable authority, aircraft manufacturer and operator procedures always prevail.

Reference links retained from the article

ACAS operating procedures and response to Resolution Advisories.

https://www.icao.int/sites/default/files/safety/airnavigation/AIG/Documents/Safety-Recommendations-to-ICAO/ICAO-actions/02001351_Action_02.pdf

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FEATURE 06 | HUMAN PERFORMANCE



NFA editorial illustration | Visual context, not procedural guidance

Fatigue of pilots.

Understanding how sleep loss, circadian disruption and sustained operational demand can progressively reduce a pilot's performance margin.

[Read the public English edition online](#)

Fatigue rarely announces itself through one dramatic failure. More often, it narrows attention, weakens monitoring and quietly consumes the mental reserve a crew may later need when the operation becomes complex.

Fatigue is best understood as a changing operational exposure - not as a personal weakness or a condition that willpower can reliably overcome.

01 - UNDERSTANDING THE CONDITION

Being awake is not the same as being operationally alert

In professional aviation, fatigue is more than feeling tired after a demanding day. It is a physiological condition associated with reduced mental or physical performance capability. The pilot may still converse normally, complete familiar actions and appear functional while vigilance, working memory, judgment and the ability to recover from surprise are already less reliable.

Two biological processes are central to understanding why this happens. Sleep pressure grows with time awake and with inadequate recovery, while the circadian system creates predictable changes in alertness across the biological day. Long-haul operations can bring both processes together: extended wakefulness, duty during a circadian low, time-zone displacement, irregular sleep opportunities and an unfamiliar rest environment. The result is not simply discomfort. It is a reduction in the margin available for monitoring, anticipation and sound decision-making.

Fatigue is best understood as a changing operational exposure - not as a personal weakness or a condition that willpower can reliably overcome.

A short period of sleep or in-flight rest may improve alertness, but recovery is not always immediate. Sleep inertia can temporarily impair performance after waking, particularly after deeper sleep or at an unfavorable circadian phase. For this reason, the timing and management of rest must remain within the operator's approved procedures and fatigue-risk framework.

02 - ON THE FLIGHT DECK

How fatigue changes the quality of performance

The operational concern is not that every fatigued pilot will make an error. It is that performance becomes more variable and less resilient. Attention may become narrower, cross-checks less deliberate and interruptions more disruptive. A crew can continue to perform routine tasks while taking longer to recognize that the situation has changed. Small discrepancies may be noticed but not fully interpreted; an automation mode change may be seen but not connected quickly enough to its flight-path consequence.

Communication can also lose precision. Messages become shorter, assumptions remain unspoken and confirmation may become superficial. Under these conditions, effective CRM is not an abstract interpersonal ideal. Clear task allocation, deliberate verbalization of threats, active monitoring and respectful challenge help the crew preserve a shared operational picture when individual cognitive reserve is reduced.

THE CRITICAL TRANSITION

A fatigued crew may move from anticipating the operation to reacting to it. The earlier that change is recognized, the more time remains to simplify, communicate and protect decision margin.

The exposure can become most consequential during descent, approach, landing, taxi and an unexpected abnormal event. These phases combine high information flow, time pressure and reduced tolerance for delay. Fatigue may make the continuation of an original plan feel easier than the mental work required to reassess it, even when weather, fuel, runway conditions or aircraft status have changed. This is why objective gates, stabilized-approach criteria and company decision frameworks are especially valuable:

they reduce reliance on a tired crew's subjective sense that the situation remains manageable.

03 - MANAGING THE RISK

Compliance provides boundaries; risk management provides understanding

Flight and duty-time limitations establish essential legal and operational boundaries, but remaining within a numerical limit does not guarantee the same level of alertness for every pilot, route or duty. ICAO describes both prescriptive fatigue-management approaches and performance-based Fatigue Risk Management Systems. An FRMS is data-driven and uses scientific knowledge together with operational experience to monitor and manage fatigue-related safety risk. It operates under regulatory approval and within the service provider's safety-management structure.

Effective fatigue management is therefore shared. Regulators define the applicable framework and oversee it. Operators design schedules, provide rest opportunities, monitor operational data, maintain reporting processes and apply mitigations. Crew members use the rest opportunities provided, assess fitness for duty, follow approved fatigue-reporting procedures and communicate when alertness may be insufficient for the task. None of those responsibilities cancels another.

A mature system looks beyond a single report or individual roster. It searches for patterns: repeated circadian disruption, difficult sequences, short recovery opportunities, disruptive schedule changes, route-specific exposure and the relationship between fatigue reports and other safety data. The aim is learning and continuous improvement - not the promise of eliminating fatigue or achieving zero risk.

Rules establish the operating envelope. A credible fatigue-risk process examines what is actually happening inside that envelope.

04 - PROFESSIONAL JUDGMENT

Protecting the remaining margin

For the pilot, the most useful question is not simply "Am I tired?" It is whether the crew still has the alertness and cognitive reserve required for the operation ahead. That assessment must consider the phase of flight, time awake, recent sleep, circadian timing, workload, weather, airport complexity, aircraft status and the possibility that an abnormal event could suddenly increase demand.

When fatigue risk is present, professional discipline favors early action within the applicable system: acknowledge the condition, share relevant concerns, strengthen monitoring, simplify where permitted, use the operator's reporting and fitness-for-duty processes, and protect objective decision gates. Caffeine, bright light, activity or conversation may temporarily support alertness in some circumstances, but they do not replace sleep and must not be presented as substitutes for approved rest, scheduling controls or operator procedures.

The deeper lesson is that fatigue management belongs to the same professional chain that guides all NFA education: knowledge supports understanding; understanding supports competence; competence strengthens judgment; and better judgment contributes to safer operations. Recognizing reduced capacity is not a failure of professionalism. Ignoring it can be.

KNOWLEDGE → UNDERSTANDING →
COMPETENCE → JUDGMENT → SAFER
OPERATIONS

OFFICIAL REFERENCE FRAMEWORK**Continue with the authoritative sources**

This article provides educational context. Applicability depends on the current regulations, approvals, manuals and procedures governing each operation.

[ICAO - Fatigue Management ↗](#)

[ICAO - Doc 9966 and implementation manuals ↗](#)

[FAA - AC 120-103A: Fatigue Risk Management Systems ↗](#)

[EASA - Fatigue Risk Management ↗](#)

EDUCATIONAL SCOPE AND AUTHORITY

This NFA article supports professional understanding. It does not provide medical advice and does not supersede ICAO, FAA, EASA, ANAC or other applicable requirements; approved operator fatigue-management processes; flight- and duty-time limitations; company SOPs; or fitness-for-duty and reporting procedures. Always consult the current authoritative material applicable to your operation.

Reference links retained from the article

[ICAO - Fatigue Management ↗](#)

<https://www.icao.int/operational-safety/fatigue-management>

[ICAO - Doc 9966 and implementation manuals ↗](#)

<https://www.icao.int/publications/doc-9966-includes-complete-set-fatigue-management-implementation-manuals>

[FAA - AC 120-103A: Fatigue Risk Management Systems ↗](#)

https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentid/1021088

[EASA - Fatigue Risk Management ↗](#)

<https://www.easa.europa.eu/en/domains/air-operations/fatigue-risk-management>

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