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The Unshared Sky: Friendly Drones, Air Defence and Reliability of the Common Air Picture

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Abstract

Small unmanned aircraft are now launched by formations far below the level at which air defence once expected to plan them. Surveillance can show that a low-level track exists, but it cannot show whether the force has authorised it. This article argues that integrated air defence needs timely and trusted knowledge of friendly unmanned activity, clear responsibility for acting on uncertainty, and procedures that survive the loss of communications. Drawing on open sources, it reviews the limits of identifying small aircraft, the Indian air defence architecture and the effect of degraded networks. It proposes a five-part framework, Friendly Unmanned Activity Assurance, that keeps the authority to operate, to control airspace and to engage separate, and a phased path for testing it in joint exercises.

Keywords: Air Defence, Unmanned Aircraft, Common Air Picture, Airspace Control, Joint Operations

"If you know the enemy and know yourself, you need not fear the result of a hundred battles"

— Sun Tzu, The Art of War

Introduction

Sun Tzu's maxim is remembered mostly for its first half. Air defence has spent decades learning to know the enemy, through radar, signals and intelligence. The second half asks a force to know itself, and with many small aircraft in the sky, this dictum has become harder than it was.

The scenario that follows is hypothetical. It is built from conditions any air defence officer would recognise, and it describes no actual incident.

At first light, a reconnaissance team of an infantry battalion launches a small unmanned aircraft from a ridge line to look at a stream crossing. The plan is short and

local: a flight of 10 minutes, a loop over the crossing, recovery on the same ridge. The team reports the launch on the battalion net. The company commander passes it up in his next situation report, and brigade headquarters records it. It does not reach the air defence detachment covering the brigade's rear area, which works on a different net and answers to a different staff.

Three kilometres away, a troop commander of that detachment sees a small aircraft cross his front at low level. It is slow, it carries no marking he can read, and it is flying towards the road along which the brigade's reserve will move. Intelligence has warned of hostile drones on this axis since the previous evening. His orders allow him to engage aircraft that are hostile or that act in a hostile manner. He has no sign of hostile intent to go on, only an absence of information. His call to brigade headquarters waits behind two reports of contact. The aircraft turns away and drops behind the ridge.

Nothing was fired, and nobody did anything wrong. The team launched under its orders and reported by the book. The troop commander held fire and asked. Yet for some minutes, a friendly aircraft was an unknown one, and the force had no means of saying otherwise. Had the aircraft been hostile, the same minutes would have gone to the enemy.

The scene points to a gap that widens with every friendly unmanned aircraft launched. A force can hold a usable picture of what is flying and still lack current knowledge of what its own formations have put into the air. When a few aircraft fly centrally planned sorties, coordination can bridge the gap. When many formations launch small aircraft on short sorties, and plans change after launch, coordination struggles to keep pace.

This article argues that better surveillance alone cannot close this gap. Integrated air defence needs timely and trusted knowledge of friendly unmanned activity, clear responsibility for acting on uncertainty, and procedures that survive the loss of communications. India should develop a joint arrangement of this kind, with the authority to fly, to control airspace and to engage kept separate and clearly assigned.

When Friendly Unmanned Aircraft Become an Air Defence Problem

Until recently, an unmanned aerial vehicle (UAV) was a scarce asset. A few aircraft were held at higher headquarters and flown from established sites on plans filed

in advance, and air defence staff knew them as well as they knew the manned aircraft in the same airspace. Coordination worked because there was little to coordinate.

That condition is changing. Small unmanned aircraft are now employed at low tactical levels. A reconnaissance team may launch several aircraft in an hour, each for a short sortie, from positions that move. Loitering munitions add aircraft that are expendable by design and are flown to a target rather than back to a recovery point. Plans change after launch, because the commander's interest shifts or the aircraft discovers something that was not expected. Several formations may need the same piece of low airspace at the same time, and each may be unaware of the other.

The effect on air defence is a question of volume and tempo. A system built to track a limited number of centrally planned flights can be overwhelmed by a large number of locally planned ones, even when every flight is authorised. The information that matters is held by the launching unit, changes quickly, and is least likely to reach an air defence centre when the battle is most intense.

Two problems arise from this, and they should be kept apart. The first is 'collision avoidance', which concerns the physical separation of aircraft that share airspace. Friendly unmanned aircraft may threaten manned helicopters and fixed-wing aircraft flying at low level, and they may drift into the engagement zones of friendly weapons. This problem is serious but largely one of keeping aircraft apart, and altitude blocks, area restrictions and timed procedures can manage it.

The second is 'identification'. An air defence organisation must decide whether or not the unknown track is a threat. If friendly activity cannot be established with reasonable confidence, then a track that is in fact friendly may be engaged, or a hostile one may be treated as friendly and allowed to pass. This is a different problem, because it bears directly on the decision to fire. Measures that reduce collision risk do not necessarily settle it.

Published accounts suggest the difficulty is recognised. A handbook of the United States Army's Center for Army Lessons Learned states that, added capability brings added complexity in integrating more airspace users, and also identifies likely points of friction at brigade level and below (Braszko, A. and Marvel, B. 2025). An

American aviation brigade, reported in February 2026, that the growth of small unmanned aircraft had crowded low-altitude airspace and forced its units to deconflict many drones from helicopters (Laga, L. 2026). These sources describe American practice, and they cannot be read as a description of Indian conditions. They are useful because they show the problem as practitioners meet it. Neither addresses identification for air defence.

Ukraine offers further evidence, though it needs careful handling. In May 2023, the Ukrainian Air Force said that it had destroyed one of its own Bayraktar TB2 aircraft over Kyiv after losing control of it during a planned flight. A defence journalist observed that air defenders were on alert and that the aircraft's profile resembles that of some Russian drones, which makes identification harder (Trevithick, J. 2023). Its cause was still under investigation when reported, and the case shows a loss of control rather than a failure of identification. A broader claim comes from the developers of one Ukrainian identification system. They state that, before it was introduced, almost half of the drones lost were downed by the military's own electronic warfare, air defence and interceptors, and that friendly-fire cases fell by about 90 per cent afterwards Odessa Journal, 2025). No method is given for either figure, and both come from interested parties. They suggest that friendly fire is a concern in Ukraine. They do not show how often such confusion reaches an air defence centre, and isolated incidents cannot be used to estimate a general rate.

The weight of the problem lies where decisions on engagement are made. Once unmanned sorties are routine at low level, those who must act on unknown tracks need some way of learning what their own side has launched.

The Limits of Identification

Air defence action, on an unknown track, involves five functions. The force must detect the object, track it, correlate it with authorised activity, form a view of its identity, and decide whether to engage. Sensors perform the first two, and a commander with authority performs the last. Friendly unmanned aircraft cause most difficulty in the middle two, which are often treated as part of tracking.

Detection of small aircraft is itself uncertain. A small airframe made largely of plastic or composite material returns little energy to a radar. Slow or hovering flight

places it in the part of the radar picture that is filtered out to suppress clutter from vegetation, buildings and moving vehicles. Birds produce similar returns. The result is a track that appears, disappears and reappears, sometimes displaced from where it was last seen. Each break in a track raises the question of whether the contact that appears next is the same object as the one seen earlier, or a different one (everything RF Editorial Team, 2026).

Additional sensors help, but within limits. An electro-optical camera or a passive radio-frequency detector can show that an object is a small aircraft, and may suggest its type. It cannot show who sent it. A hostile and a friendly quadcopter of the same make may look alike through a camera. Fusing sensors improves what the force knows about the object, and says little about what the object is authorised to be doing.

Conventional means of identification do not lessen this gap. Identification, friend or foe (IFF) systems were designed for aircraft that carry transponders and operate within a shared cryptographic arrangement. Fitting such equipment to a small expendable aircraft raises problems of weight, power, cost and the compromise of key material if an aircraft is captured. Whether any force has fielded a general solution for small tactical aircraft is not established in the open sources consulted for this article, and it should not be assumed.

Remote identification, as used for civil unmanned aircraft, offers a partial analogy. Such systems broadcast an identifier and position so that authorities can recognise a given aircraft. Researchers have shown that the identifiers of one widely used commercial system can be captured with inexpensive radio equipment, and that they can expose the position of the operator (Bender, C. 2022). A military force that broadcast the position of its own aircraft would reveal its operating areas to an adversary. For these reasons civil remote identification, which broadcasts openly, would need hardening before military use. The study cited covers one commercial system only. One Ukrainian developer has publicly described a system that identifies friendly aircraft for air defence, but the claims are the developer's own and do not show that the problem has been solved (Odessa Journal, 2025).

A further distinction matters most. A 'surveillance track' says that something is present. 'Mission information' says what the force has authorised. These are separate kinds of knowledge, produced by different people, and they have to be matched. A match raises confidence that the track is friendly. It does not establish it, because a hostile aircraft may fly in the same place. A mismatch does not establish hostility either, because the record may be stale or the plan may have changed.

Two errors follow. A force that treats every uncorrelated contact as hostile will engage its own aircraft and lose confidence in its own picture. A force that gives a declared friendly mission too much weight may allow a hostile aircraft to use a friendly flight as cover. The right response lies between these errors and depends on the age of the information, how it was received and what is at risk if the judgement is wrong.

The analytical question is therefore a practical one. What degree of confidence in identity can the force reasonably establish from the information available, and who is responsible for acting on the remaining uncertainty?

India's Joint Airspace Challenge

India does not start from nothing. The Indian Air Force (IAF) operates the Integrated Air Command and Control System (IACCS), —the backbone for real-time coordination among the three services (Press Information Bureau, 2025b). The Army's air defence control and reporting system viz. Akashteer, is often seen as the core of Army air defence and as connected to IACCS and to TRIGUN, which is attributed to the Navy (Press Information Bureau, 2025a). A report in June 2026 on Exercise Josh 2-26 says that Akashteer "seamlessly plugged in" to IACCS, and that IACCS builds a composite air picture from data links and surveillance sources, including drones, sensors and radars (Banerjee, A. 2026). Operation Sindoor in May 2025 is seen as a test-case of this layered arrangement against drones and loitering munitions (Press Information Bureau, 2025b).

These sources establish that, the connection exists and that it is valued. They do not describe what moves across it. None of the accounts consulted says whether the launch, route, area, validity period or changes to a friendly unmanned mission are passed from a ground formation to the air defence picture, in what form, or how quickly. One official article claims that integration lowers the risk of engaging friendly

targets, but it gives no mechanism, and it is promotional in tone (Press Information Bureau, 2025a). This article therefore treats the claim as an expectation and not as evidence.

The Army's own counter-drone effort adds a second layer. SAKSHAM, a counter-unmanned aircraft grid developed by the Army jointly with Bharat Electronics Limited, is reported to run over the Army Data Network, to cover airspace up to 3,000 metres above ground and to give all formations a shared picture of unmanned aircraft (The Week News Desk, 2025).

Three features of the Indian setting make the question harder. The first is the division of responsibility. The Army fields its own air defence weapons and, increasingly, its own unmanned systems and counter-drone grid. Which element may act on an uncertain low-level track, and who clears the airspace for a friendly sortie, depends on arrangements that open sources do not set out.

The second feature is the number of operators. In many cases, an unmanned aircraft and civil air traffic uses the same region. The third is the terrain. Mountains screen radar, valleys channel low-level flight, and communications between a forward formation and a rear centre are least dependable where the need for current information is greatest.

None of this suggests that the present architecture is deficient. It suggests that the architecture, as open sources describe it, joins sensors and weapons, and that the status of friendly unmanned activity inside it has not been stated in public. That is a gap in what can be verified from outside the services, and it may be closed already inside them. If it has been closed, a published account would help others to build on it. If it has not, the problem described above remains open.

When Networks Cannot Be Trusted

Any arrangement for sharing friendly unmanned mission information will be tested first where it is most needed. A formation in contact is likely to be under electronic attack and on the move, with little bandwidth to spare. The link between that formation and the air defence centre is the weakest part of the chain, and the chain has to be designed accordingly.

The evidence from Ukraine bears on this, though it should be read with care. A report by the Royal United Services Institute (RUSI), published in May 2023, states that Ukrainian unmanned aircraft losses remained at approximately 10,000 a month and that Russian electronic warfare covered the front with at least one major system for each 10 kilometres (Watling, J. and Reynolds, N. 2023). These figures describe one phase of one war. They show the scale on which contested electromagnetic conditions can affect small aircraft, but does not say much about how often friendly aircraft are mistaken for hostile ones.

What they do indicate is that a force cannot assume that its data links, its navigation signals or its control links will be available. A friendly aircraft that loses its control link may behave unpredictably and so look less friendly. A formation that stops reporting leaves its last mission information to age. An air defence centre cut off from its sensors or from the formation sees a thinner picture without being told so. In each case, the picture degrades without announcing the fact, and the air defence controller may continue to act on records that are no longer true.

Navigation signals are one such dependency. The European Union Aviation Safety Agency reports an increase in jamming and spoofing of satellite navigation since February 2022. It notes that spoofing may be harder for a crew to detect, and that the effects of several faults together can be cumulative (European Union Aviation Safety Agency, 2026). Similar problem is also present in India. In March 2025, the government told the Lok Sabha that 465 interference and spoofing incidents had been reported in the border region, mostly around Amritsar and Jammu, between November 2023 and February 2025, and the Directorate General of Civil Aviation received reports of abnormal satellite navigation behaviour within 10 minutes after disruption at Delhi in November 2025 ETV Bharat, 2025; Press Trust of India, 2025). These are civil aviation records. They show that interference exists in the Indian operating environment. However, they do not show its effect on military unmanned aircraft.

United States Army publications have begun to take this seriously. A lessons-learned handbook on small unmanned aircraft airspace management is reported to favour procedural control over positive control, because communications are often limited in contested environments, and it relies on altitude blocks, restricted operations

zones and coordinating measures (Braszko, A. and Marvel, B. 2025). An aviation brigade has adopted a green, amber and red status scheme for operators who are not pilots, and planned to test it under degraded communications in April 2026. The outcome, however, was not found (Laga, L. 2026). These accounts concern the separation of small aircraft from helicopters. They offer a useful principle— rules that can be followed without a live link are more dependable than rules that need one. They do not address identification for air defence.

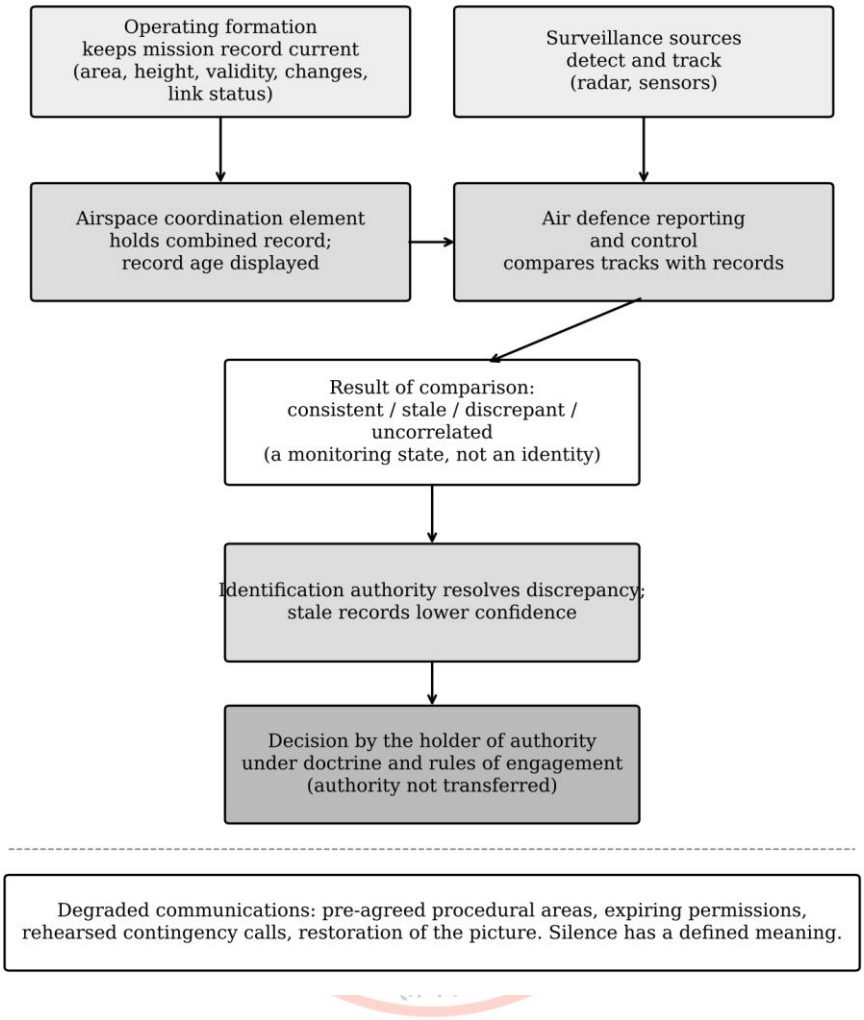
The same principle applies to the problem of this article. If mission information normally travels over a data link, a missing update has to carry meaning, and some arrangements must be agreed beforehand so that they work without a link. These measures carry costs, which commanders must weigh against the cost of engaging a friendly aircraft. The next section sets out a framework in which these choices are made explicit.

Towards a Shared Sky

This section proposes a framework for friendly unmanned activity. It is an analytical and organisational construct offered for discussion, and is not existing in the Indian doctrine. Its working name, "Friendly Unmanned Activity Assurance", says what it offers: confidence in what a force knows about its own aircraft, and no claim that a system can certify identity. "Airspace deconfliction" was set aside as a name because it describes only the collision-avoidance problem. **Figure 1** shows how mission information is intended to reach an air defence decision.

The framework has five parts. It is designed to run on the services' existing command and control systems. It asks first for agreement on responsibility and procedure, and any new software or links can follow from that agreement.

Figure 1: From Friendly-UAV Mission Information to an Air Defence Decision



Source: Author's Proposal

Mission Information Exchange

Air defence elements and airspace managers need a small set of facts about each friendly unmanned mission. At the conceptual level, these are the formation responsible, the area and height band authorised, the period for which the authorisation is valid, the time of the last update, any change made after launch, and the state of the operator's link to the aircraft. Planning needs more than this. Operational awareness needs less, and it needs it quickly. The two should be kept apart. A planning layer can carry the fuller record that is agreed before the day. An operational layer should carry only few items that air defence needs in order to act, and it should be able to travel over a narrow, degraded channel. The operational layer should work at the level of a

formation or an area block, with detail for each sortie kept by the formation and passed up only when asked for or when it changes the picture.

Identification Assurance

A mission record supports identification, but cannot establish it. If a track matches a record in position and time, the track is 'consistent with friendly activity'. That is a monitoring state, and it does not make the track friendly. A hostile aircraft may fly where a friendly one is expected, and a record may have been overtaken by events. If a track matches no record, it is uncorrelated. That does not make it hostile either. The framework therefore provides for discrepancies to be passed for resolution to the officer already responsible for identification in that sector, and not for any automatic conclusion. Weapons control status and the criteria for declaring a track hostile remain as existing orders set them. The framework adds a record for those orders to draw on, and it adds no new step to the engagement decision. A lapsed permission lowers confidence in a track. It does not by itself make the track hostile. The framework also requires that records age visibly. A record that has not been updated within an agreed period should reduce confidence in any track correlated with it, and the air defence controller should be able to see why.

Joint Responsibility and Authority

Three kinds of authority should be kept distinct. The 'authority to operate' an unmanned aircraft rests with the formation that launches it. The 'authority to control airspace' rests with whoever is assigned that task under applicable arrangements. The 'authority to engage' an aerial contact rests where doctrine and the rules of engagement place it. The framework moves none of these. It assigns four responsibilities. The operating formation keeps its mission information current and reports changes. An airspace coordination element holds the combined record and tests it for conflicts. The air defence reporting and control organisation compares tracks with records and refers discrepancies. Higher command sets the airspace and engagement arrangements within which the others work. These are functional descriptions, and they do not describe an existing Indian chain of command.

Resilience Under Degraded Communications

Where links fail, agreement made in advance has to do the work. Four measures are open for consideration— each subject to authorised doctrine, command direction and the applicable rules of engagement. The first is procedural airspace arrangements that allow friendly unmanned flights within defined areas and height bands without further reporting. These do not identify any aircraft. They give air defence a known pattern against which a track outside the pattern stands out. The second is permissions that expire after a stated time, so that silence has a defined meaning. The third is rehearsed contingency calls that a forward unit can send by any available means. The fourth is a drill for restoring a consistent picture once links return. Each measure has a price. Restricted areas reduce the reach of a sortie, expiring permissions can lapse while an aircraft is still working, and caution on the air defence side can delay response to a real threat. Commanders have to choose how much of each to accept, and the choice will change with the situation.

Validation and Accountability

The framework should be tested in joint exercises with realistic numbers of unmanned aircraft and with communications degraded by design. Five questions would show whether it works. Can formations keep their records current? How quickly are discrepancies between records and tracks detected, and by whom? Are stale records recognised as stale? Is responsibility clear when information is lost? Can authorised sorties continue under degraded conditions? Exercise planners should record times and counts for each, without setting figures in advance.

Two cautions apply to the results. A fall in discrepancies may mean only that fewer sorties were flown, so sortie rates must be recorded beside every measure. A good result under favourable conditions, such as stable links or experienced staff, may not carry over to harder ones. An improvement counts only if it holds with sortie activity maintained and conditions made harder.

From Concept to Formation Practice

A framework that depends on new systems will wait for them. This one is meant to begin with agreement and practice. The steps below are proposals for discussion.

They do not describe what any service is doing, and the responsible levels named are suggestions that doctrine and command direction would have to confirm.

Immediate Priorities

The first step is a review of how friendly unmanned launches are reported to air defence and airspace elements today. Corps and army headquarters, with the relevant air force air defence and control elements, are the natural level. It needs only staff time, access to current procedures and the cooperation of the formations concerned. The benefit is a clear statement of who knows what, and when. Success would be a written account of existing reporting, with gaps and delays identified, which exercise staffs can use as a baseline.

The second step is agreement on the essential categories of mission information and on the meaning of a stale record. The same level should lead, with inputs from formations that fly aircraft. The benefit is a shared vocabulary for different arms and services. Success would be a short common list in use at one joint training event at least.

Medium-term Priorities

Controlled army and air force exercises can then test the exchange, with realistic numbers of friendly unmanned aircraft launched from several formations in the same area. A joint planning cell working with exercise directing staff is the suitable organisation. It needs the agreed categories and a way to record what air defence elements knew and when. The evidence required is the set of measures proposed earlier, recorded alongside the number of sorties flown.

The same exercises should try degraded-communication procedures. Links should be reduced or removed on a planned schedule and the pre-agreed procedural arrangements used in their place. Participants should say which arrangements they could follow without a live link and which they could not. Success would be shown if authorised sorties continue, and discrepancies are noticed and referred, under degraded conditions.

Longer-term Priorities

Findings from exercises can then be taken into joint doctrine and training. Where it proves useful, interfaces between the services' systems can be standardised so that mission information passes in a common form, and validated requirements can be carried into future command and control development. The responsibility lies with the bodies that write doctrine and set requirements, and the prerequisite is a body of exercise evidence. Success would be validated requirements appearing in doctrine and procurement documents.

No costs or dates are proposed. Such estimates would be invented, and they would depend on decisions that belong to the services. Each step uses exercises already planned and staff already in place.

Conclusion

Return to the troop commander at the opening of this article, watching a small aircraft cross his front at first light. What he lacked was a current, trusted statement of what the battalion had launched, and a clear understanding of who was to act on the doubt.

Under the arrangement proposed here, the scene would not become simple. The aircraft might still be friendly or hostile. The difference would lie in what the troop commander and the air defence centre could see, and in what had been agreed beforehand. The battalion's launch would appear in a record that shows when it was last updated, and its age would lower confidence in any match. A discrepancy would go to the officer responsible for identification, and the troop commander would not be left to settle it alone. If the link had failed, a pre-agreed procedure would say what silence meant and for how long a permission held. The authority to engage would sit where doctrine already places it. The troop commander would still have to judge, but on a clearer basis and with a defined responsibility.

The principal conclusion is that the credibility of a common air picture depends on more than sensors and networks. It depends on whether a force can say, with stated confidence, what its own aircraft are doing. Each friendly unmanned aircraft added to the sky without such knowledge makes that picture harder to trust, and a picture that cannot be trusted will be acted on cautiously or ignored.

India's services have built, as open sources describe it, an air defence architecture that joins sensors to weapons across the services. The next step is smaller and may be harder. The Army and the Air Force should agree, in a form that exercises can test, what air defence must know about friendly unmanned activity, who holds that knowledge, and what is to be done when it cannot be passed.

An older Indian tradition of war tied the order of an army to signs its own side could read. Kautilya's treatise has the parts of an array named after the sounds, flags and ensigns that every soldier knew:

> *"The constituents of the array of the army should be called after the names of trumpet sounds, flags and ensigns"*
>
> **—Kautilya, Arthashastra, Book X, Chapter VI, trans. R. Shamasastry**

A sky of small unmanned aircraft needs signs of its own, and there will be records and procedures where the old ones were flags. A force must be able to say, with stated confidence, what its aircraft are doing. A friendly aircraft engaged, or a hostile one waved through, is the price of not knowing. A force will not be judged only on how many aircraft it can put into the air. It will also be judged on whether it can still differentiate its own aircraft from that of its adversaries.

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