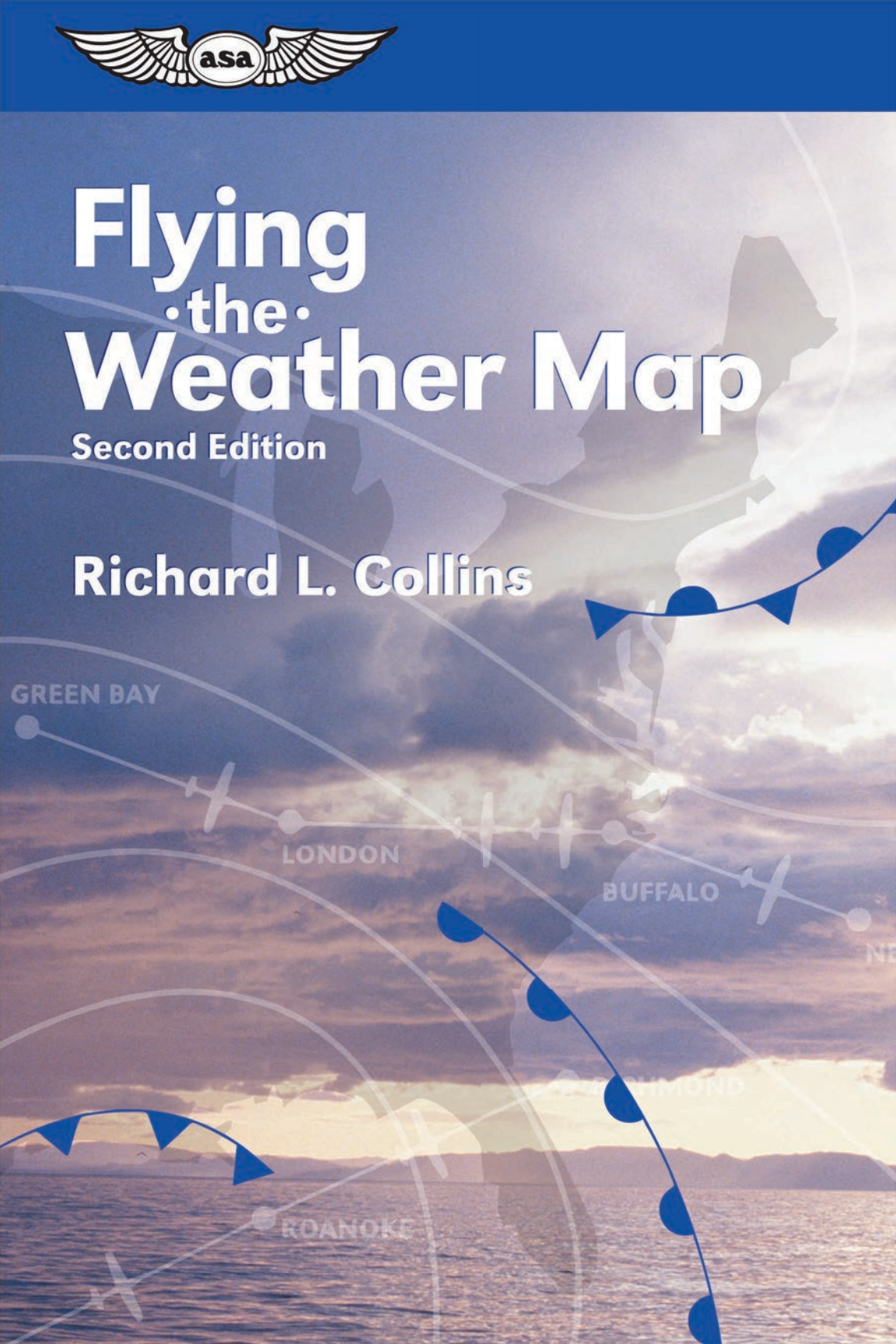
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Flying
the
Weather Map
Second Edition
Richard L. Collins
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Flying the Weather Map
Second Edition
by Richard L. Collins

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Contents

Low Pressure 1

If flying the weather was a game with only one specific question allowed before each flight, what would be the best thing to ask? There is no doubt that potentially the most useful question would be: "Where are the low pressure centers?"

Lows are weather makers. They can affect wide areas, and if we don't understand anything else about meteorology, we had better understand some basics about low pressure. When all the forecasts seem in error, and there are a lot more questions than answers, a low is probably misbehaving. It is moving faster or slower than anticipated, or perhaps it is deepening (strengthening) or filling (becoming weaker). Or maybe a low formed in an unexpected location. Only if we know the characteristics of a low can we construct a mental image of weather situations—especially of situations that are changing rapidly and defying the efforts of forecasters.

The basic circulation around a low is counterclockwise in the northern hemisphere, which will be the area of discussion throughout the book. Air also flows into a low. If it flows into a low and stops, the low begins to fill and the area of low pressure will simply go away. For the low to live on, air must flow into the low and then move upward in the atmosphere.

We must understand that upper air patterns have a lot to do with surface systems. The most important key to upper level influence is found on the 500 millibar chart. This reflects the pressure patterns at approximately 18,000 feet, which is the center of the vertical distribution of mass. There are charts for higher levels, but there is little change in the patterns from the 500 millibar surface on up. We will discuss the relationship of the 500 millibar chart to surface weather in Chapter 3, and use it extensively in examining weather situations in the last four chapters of the book.

Moisture

Moisture supply has a lot to do with weather, and if we compare geography with the counterclockwise circulation around low pressure centers, we get a good idea of how this works.

When a low is to the west of a given point, the circulation at that location will be from the south. That means relatively warm air, and potentially moist air, depending on the area from which the air is being drawn. Basic

meteorology teaches us that air assumes the properties of the surface over which it flows, and the effects of southerly circulation at different locations clearly illustrates this.

Start at Denver, where a south wind comes from over old and New Mexico. This is dry country, and Denver's average annual precipitation totals only fifteen inches a year.

Move now to Wichita, 400 miles to the east. There is more potential circulation from over the Gulf of Mexico and the average annual precipitation moves up to twenty-eight inches.

Move even farther east, to Little Rock, directly north of the Gulf, and note an average annual precipitation of forty-eight inches. This forty-eight inches, incidentally, is about an average for cities that are directly north of the Gulf of Mexico and inland a few hundred miles. Montgomery, Alabama, and Atlanta both have about the same average annual precipitation as Little Rock.

Around the Low

Put a low pressure center on a map and visualize the circulation around it. Figure 1 is an example. The low center over central Arkansas has three circulation arrows for illustration. Relate each to the surface over which it flows. The one coming from the south brings warm and moist air to the low from over the Gulf. This is the basic feed of the system. The easterly circulation brings moisture from over the Atlantic, but this is not as warm and perhaps not as wet as that southerly arrow. From the northwest we have dry and cold air.

For contrast, consider a low over the northwestern corner of Colorado, as in Figure 2. Not one bit of circulation has close access to a lot of moisture. The low in Colorado might be characterized more by strong winds than by frog-strangling precipitation. Indeed, there is a sign in Gunnison, Colorado, proclaiming that the sun shines at least a little on every day of the year.

Low pressure areas don't often remain stationary, but when one does, the rising air is mostly in the center of the low. A low that remains stationary can become quite strong, with increasing circulation as it deepens. Everything eventually has to move, though, and when a low pressure area is on its way, the major ascent of air in the low is usually on the forward side, in the direction of motion, which is usually to the east or the northeast. Thus we would usually find clouds stacked high ahead of a moving low as warm, moist air moving up from the south at low levels is lifted over a wide area. And, a moving low can maintain strength as it feeds on the warm moist air moving northward ahead of it.

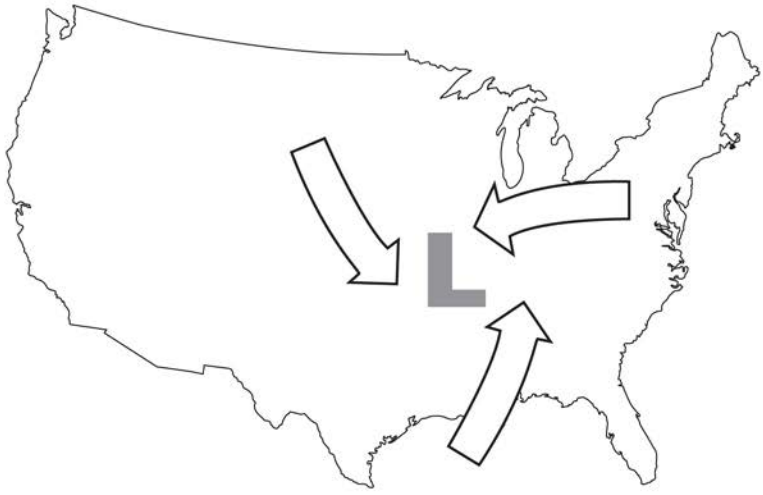

Figure 1

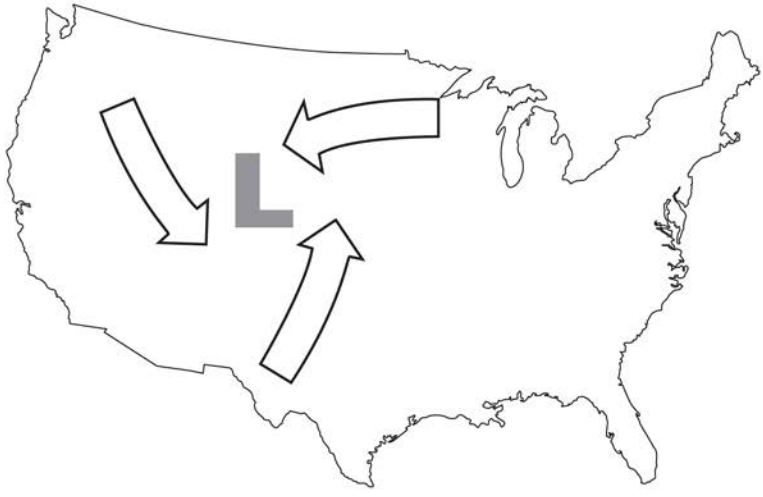

Figure 2

In seeking information about weather, we occasionally hear people remark that there is "no weather" in connection with a given low pressure system. This might be true today, but things can sure change by tomorrow. The low in Colorado is dry because it doesn't have a good moisture source from which to brew clouds and precipitation. Move it 800 miles to the east and the character or the system might change completely.

Upper Air Patterns

When we acknowledge that air rises in a low, we see the basis for the effect of upper air pressure patterns and circulations on the severity of low pressure systems. The upper patterns contribute to the development of lows and steer them once they have formed. Some very specific effects will be covered in Chapter 3. For now, just remember that the weather map on the wall at the flight service station, and the one shown on TV, is a surface weather map. If a low is depicted with little weather around it, that is because of geography or lack of support in the upper air circulation. As the low moves, the geography around it changes. As time passes, the surface low's relationship with upper air patterns changes. The primary point is that no low pressure system should be discounted until it is well east of your position. If it's still coming your way, it can change and change rapidly. Or if conditions to the west, southwest, or south are ripe for low pressure development, a clear day can turn "cruddy."

Birth of a Low

The development of a low pressure system is worth examining briefly here.

Basically, a low can be formed when dissimilar air masses rub against each other. Think of the breakers and the undertow at the beach. Water is moving toward the shore, and it is also moving away from the shore. Friction develops between the two (and/or between water moving toward the shore and the bottom) and, presto, the water curls up and over into a breaking wave. Turning to weather, if you have a southwesterly circulation next to a northeasterly circulation, the same thing can happen. A wave can develop and it can curl up and over and form a low pressure center. Sometimes the circulation does not loop quite all the way over and a full circulation doesn't form; instead, waves develop and move along the boundary between the two air masses. These are called low pressure waves.

Flying the Weather Map

Second Edition

"Weather is what you find, not what you expect to find"
–From *Flying the Weather Map*

Richard L. Collins

There is nothing so valuable in aviation as experience. In *Flying the Weather Map* veteran aviator Richard Collins shares his extensive experience with all pilots, offering proven techniques for weaving pre-flight forecasts and in-flight observations into the fabric of safe and successful flights.

After an in-depth discussion of weather theory, Collins takes us along on **46 actual cross-country flights** from his own logbooks: From solid IFR to marginal VFR, we fly with him in his light airplane in all weather and in all seasons. Each flight begins with a depiction of that day's weather maps, general conditions, and charts showing the intended and actual routes. Mile by mile the flight is analyzed in Collin's clear and deliberate style, constantly comparing weather theory and the pre-flight information with the actual conditions beyond his windscreen. The decisions these comparisons lead him to along the way—diversions to alternates, new route requests, and even returns to his airport of origin—become our own hard-won experiences.

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Richard Collins has spent his life in aviation, logging over 18,500 flight hours in almost every type of aircraft, and writing about it in 900 magazine articles and 11 books for pilots—plus many video productions. He has been editor-in-chief of *Flying* magazine, and publisher and editor-in-chief of *AOPA Pilot* magazine. Collins has won many aviation awards and continues to do extensive research in aviation safety. He is currently editor-at-large for *Flying* and editorial consultant to Sporty's Academy.

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