procedures; mid-term program provides improvements in observations, severe weather detection, processing and dissemination; and the longer-term program is starting to define interagency activities to provide the basic technology for further enhancements in short- and long-term forecasting and improved automated observation systems. The goal is automated sensing, processing and real-time dissemination of weather products to the system users.

"AIRLINE METEOROLOGICAL REQUIREMENTS"
C. L. Chandler and John Pappas

Yesterday, as I was about ready to leave the office, the telephone rang. It was Walter asking for help. I will volunteer for anything, more or less, if it has to do with airplanes and weather. The only reason I volunteered to help is that immediately I knew in my mind who could give this paper much better than I. You don't have to twist his arm too hard. We have that man here today—Mr. John Pappas, who will present this paper; and, hopefully, both of us together can make up at least 30% of Dan. Maybe not, but we will give it a try. Last night I asked Walter if I could give about an one-minute speech off the agenda, completely on another subject, and he said it would be all right.

Many of you may not realize that today is an historical date in aviation. Exactly 25 years ago on this date, Pan American started their transatlantic service with a 707-120 aircraft. In about T-8 hours, that 120 at Kennedy or Idlewilde, at that time, had about a 57-second ground roll; he had 6,000 pounds of water (some of you old-timers know what that water was for). My latest information tells me that tonight they are going to reenact that flight. I have not heard otherwise. They are going to take a 707 out of Kennedy to Gander to Paris with the same passenger load (I believe it was 94); they say they are going to serve the same kind of food. They found many of the members of
the original flight crew and cabin attendants; and
I understand they will also have about a week-long
party in Paris for the invitees. I tell you that be-
cause I am proud. I was a part of that operation
at that time. So was E. B. Buxton. One more
thing, I would like for the aircraft manufacturers
and the air traffic control people from FAA that
are here today to give a little thought to what I'm
about to say now.

In 1961, the schedules between Atlanta and Dal-
las/Fort Worth as a typical airline city pair were
fifteen minutes faster than they are today, and it
was real. We made it in one hour forty-five min-
utes in those days. It takes two hours now. We
doubled the speed overnight in 1958. We went
front 230 knots to 460 knots overnight; but in over
20 years, we are slowing down. Keep in mind, a
passenger buys a ticket because of the fastness of
the airplane in most cases. So, this is something
for you people to think about.

John Pappas has
about
20
years in the air weather service. He was
our manager at Southeast Weather in Atlanta for
about five years and for the past seven years, he's
been Manager of Meteorology at Western in Los
Angeles. I would like to present John Pappas.

John Pappas
You heard what Chan said about being called upon
to do this impromptu and how quickly he accepted.
Of course, what he had in mind was making the
introduction and I would make the presentation.
So, welcome to the “Chan and John Show”—how
do you like us so far?

The operational objectives of an airline are: Safety,
convenience, comfort, and economy. Our meteoro-
logical requirements necessary to reach and main-
tain these objectives are many. The first thing that
comes to mind is what I call “Weather Data Com-
unication Reliability.” It is not enough to de-
velop systems that improve upon current systems.
Systems that increase data storage capacities and
allow us to transmit data at phenomenally faster
and faster speeds are great; but meaningless un-
less the data that these systems provide get to the
user.

From the users point of view, and the airlines are
users, there is nothing more frustrating to an air-
line dispatcher or meteorologist who has to make
a continuous wide array of decisions that require
meteorological data around the clock, and the data
isn't there. The data is available, and the equip-
ment to transmit and receive it is available, but it
is not getting through. Many manhours are spent
on the telephone desperately trying to find some-
one in the communication chain that can help get
that data to you. “Weather data communication
reliability”—we want to confidently know that the
data communication systems are reliable and we
will receive data consistently.

Our other requirements are mostly traditional. Of
course, we require accurate hourly observations.
Moreover, they should be complete, and contain
all significant elements, including remarks that am-
pify or enhance paraticular elements. For ex-
ample, clear NW, lightning South. We're con-
cerned that automated weather observations will
not be able to provide significant remarks. For
those preparing forecasts and those making oper-
a tional decisions, remarks are important.

There is also a requirement for a special observa-
tion whenever the ceiling or visibility goes above
or below 2,000 feet and/or three miles. This is
required to enable airlines to satisfy alternate re-
quirements. We feel very strongly about this.

Upper-air observations are needed. We must have
a system that provides accurate temperature, hu-
midity, and pressure height data, as well as wind
direction and speed. There is lots of interest in the
radar-profiler today to provide upper-air data. To
reiterate and emphasize, we must have pressure
height data, accurate temperature and humidity
information, as well as wind direction and speed.

There is a continuing requirement for radar obser-
vations. We, of course, want equipment designed
specifically for weather surveillance, the NEXRAD
idea. Weather satellite observations are required.
A few years ago, requirements for satellite data
did not exist. Today, these observations are a very
important part of airline requirements and are be-
coming increasingly important.

We need accurate terminal forecasts, including fore-
casts of severe weather phenomena, low-level wind
shear, icing, snow, ceilings, and visibility.

RVR forecasts are definitely something that should
be provided. Moreover, forecasts that correspond
to the operational ceiling/visibility categories are
necessary to make aviation forecasts more mean-
ningful. The special category for ceilings and/or
visibility of 2,000 feet and/or three miles, men-
tioned earlier, would permit IFR flight planning
without an alternate and save millions of dollars
in unnecessary expenses.
Improved upper-air forecasts have been a special requirement since the dawn of commercial aviation. It is even more significant today. Operating costs of most airlines have quadrupled during the past decade. There has been very little improvement in the forecast models that could offset some of these rising costs. We are encouraged with the work of NASA’s Bob Steinberg and his MERIT program. This kind of research is encouraged by the aviation community. Some examples of the impact of upper winds on operating costs are the following:

For an airline the size of Delta, that operates approximately 1,500 flight segments per day, a change in wind that affects the flight time by as little as six seconds and 20 pounds of fuel adds up to approximately $3,900.00 per day in operating costs. This is almost $1.5 million per year. This kind of money is more than enough to cover the operating budget of an airline’s meteorological/flight planning department. One knot of tailwind for a DC-10 operating between Los Angeles and Honolulu is worth 200 pounds of fuel. One knot! These are real numbers. Wind speeds equal to 40 percent or more of a commercial jet’s true airspeed occur. Not all of the time, but they do happen, and we feel that ATC system does not consider the impact of this phenomenon. We could plan and fly great circle routes on every trip. However, we must use the wind as an energy source, a free energy source. Atmospheric winds are not constant; large variations with time, as well as vertically and horizontally, mandate that we plan and fly in order to reduce the negative impact of headwinds and increase the beneficial effect of tailwinds. Temperatures are important also but wind makes the greater impact on economy. Upper wind forecasts must be improved.

Finally, the requirement for meteorological instrumentation needs to be mentioned. Many of you in the audience probably deal with this and have a similar interest. The low-level wind shear alert system (LLWSAS) is an airline requirement—absolutely! We need further development and installation of the Doppler Radar System. These, and all other weather measurement instruments and systems, are going to be of interest to the airlines for many years to come.

This concludes our presentation on Airline Meteorological Requirements. I thank you for listening and bearing with us.

"GENERAL AVIATION’S METEOROLOGICAL REQUIREMENTS"
Dennis Newton

The theme of this year’s workshop is Communication and Application of Atmospheric Data for Aviation Needs. One could certainly say that this theme has been implicit in all of these workshops. However, the stress on communication seems to me to be both important and appropriate, for two reasons. First, the value of weather data to aviation is often extremely perishable. It becomes quite useless if not quickly and accurately communicated to the people who need it. Furthermore, communication of weather theory and information about weather service products to pilots in an accurate and comprehensible manner is essential to flying safety in general. Probably no one needs weather knowledge more than the people who fly through it.

The specific subject of this overview paper is General Aviation’s Meteorological Requirements. However, before one addresses the subject of General Aviation’s requirement for anything, it is well to say something about what is meant by the term, General Aviation. In the broad view, the term can be, and often is, taken to mean all of civil aviation except the airlines. It would be virtually impossible to cover the meteorological needs of all of that in a single paper, in addition to which, one result of trying would be considerable overlap with Mr. Olcott’s forthcoming paper. Therefore, I would like to limit the subject somewhat by listing some common characteristics of that portion of the broad category of General Aviation with which this paper will be concerned. The following items should not be taken as a definition, but more as a working hypothesis derived from experience of the makeup of the spectrum of weather customers, if you will, whose needs are considered here.

1) The segments of General Aviation treated here will be those which operate below an altitude of about 25,000 feet. Within that operating regime, there is a broad spectrum of aircraft types, ranging from light, single-engine airplanes to pres-