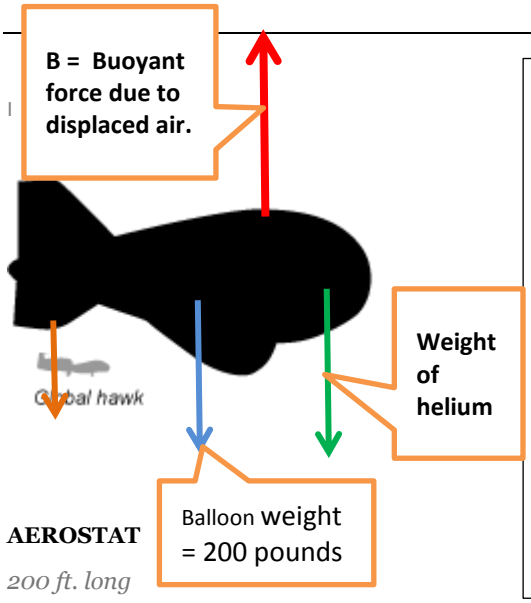
FLUIDS/ARCHIMEDES

Dr John P. Cise, Professor of Physics,
Austin Community College, 1212 Rio Grande St., Austin Tx 78701 jpcise@austincc.edu & NYTimes June 20,2011
by Elisabeth Bumiller & Thom Shanker

War Evolves With Drones, Some Tiny as Bugs



AEROSTAT

- *200 ft. long*
- *65 ft. across the hull*

INTRODUCTION: **This 275,000 ft^3 drone balloon is said below to be able to lift 1200 pounds. It is filled with helium(density = 0.1786 kg/m^3). It displaces air(air density at 15,000 ft = 0.7364. The balloon weight(material of surface) is about 200 lb(shown in blue in graphic). QUESTIONS: (a) Convert 275,000 ft^3 into m^3 ? (b) Find B(in kg) due to displaced air? (c)Find B in lb? (d) Find the mass(kg) of helium in balloon?(e)Convert(d) to pounds? (f) Find the net force(in pounds) UP? (g) Is the net force(e) up sufficient to pick up a ~1200 lb. load? HINT: mass density = mass/vol ., 0.283 m^3/ft^3 , 2.2 lb/kg , Show all calculations please.**

ANSWERS: (a)~ 7783 m^3 ,(b)~ 5731 kg, (c) ~2605 lb., (d)~1390 kg., (e) ~~ 632 lb , (f) ~1773 lb. (g)_____.

Aerostats are tethered fabric balloons filled with helium **that float 15,000 feet** in the air from a single cable. ***They can lift ~1,200 pounds(shown brown in graphic)***, including a camera that pans 360 degrees for constant real-time surveillance. They are used extensively on the Afghanistan-Pakistan border and above Kabul, where one of them is anchored at Bala Hissar, an ancient fortress. Their virtue is that they can stay aloft for months at a time, carrying a heavy load of intelligence equipment. Their shortcoming is that they cannot be moved rapidly for new assignments.

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Two miles from the cow pasture where the Wright Brothers learned to fly the first airplanes, military researchers are at work on another revolution in the air: shrinking unmanned ***drones, the kind that fire missiles into Pakistan and spy on insurgents in Afghanistan, to the size of insects and birds.*** The base's indoor flight lab is called the "microaviary," and for good reason. The drones in development here are designed to replicate the flight mechanics of moths, hawks and other inhabitants of the natural world. "We're looking at how you hide in plain sight," said Greg Parker, an aerospace engineer, as he held up a prototype of a mechanical hawk that in the future might carry out espionage or kill.

From blimps to bugs, an explosion in aerial drones is transforming the way America fights and thinks about its wars. Predator drones, the Cessna-sized workhorses that have dominated unmanned flight since the Sept. 11, 2001, attacks, are by now a brand name, known and feared around the world. But far less widely known are the sheer size, variety and audaciousness of a rapidly expanding drone universe, along with the dilemmas that come with it.

The ***Pentagon now has some 7,000 aerial drones,*** compared with fewer than 50 a decade ago. Within the next decade the Air Force anticipates a decrease in manned aircraft but expects its number of "multirole" aerial drones like the Reaper — the ones that spy as well as strike — to nearly quadruple, to 536. Already the Air Force is training more remote pilots, 350 this year alone, than fighter and bomber pilots combined.